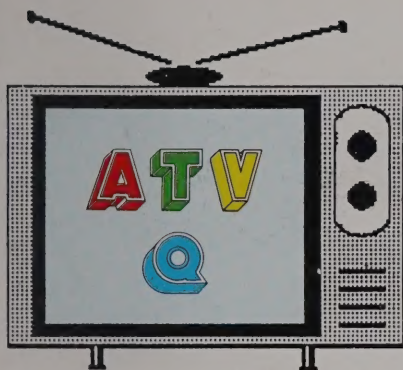


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AMATEUR TELEVISION QUARTERLY

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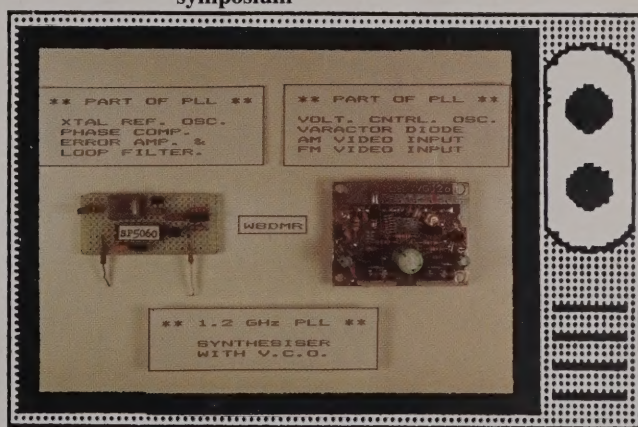
Mike, WA6SVT & Henry,
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Contest at York, PA., ATV
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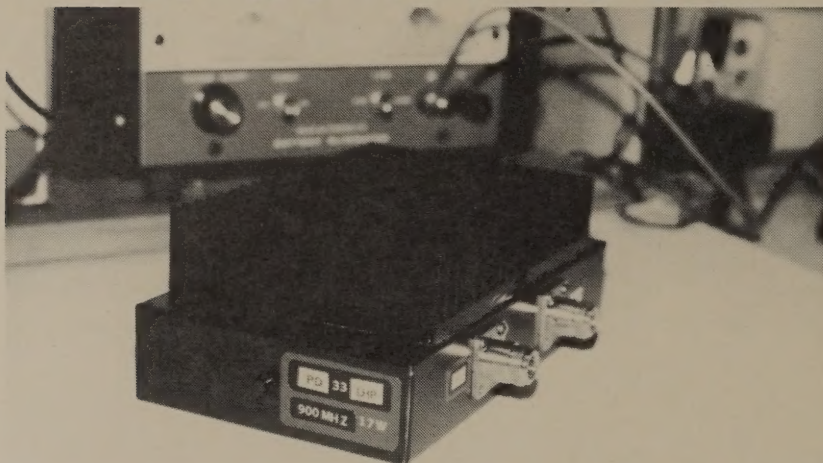
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**HOME VIDEO CONTEST
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Details page: 37

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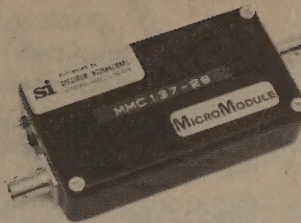
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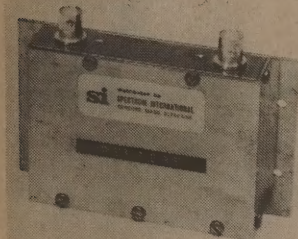
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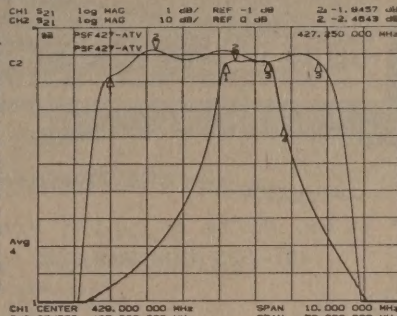
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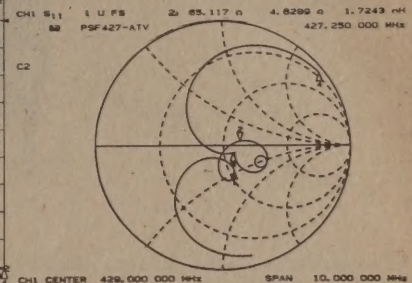


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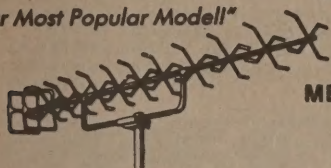
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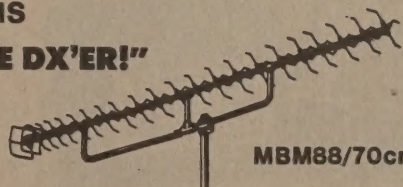
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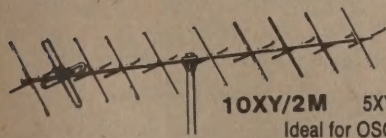


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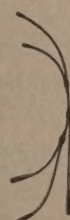
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MBM48 - 70cm	90
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1268-LY	65
1268-LY-XTN (all 21 elements)	85
1268-LY	65
1268-LY-XTN (all 21 elements)	85
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PMH- 2C 2M circ Pol	20
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PMH-4M 2M 4-way	55
PMH-70 70cm 2-way	20
PMH-70 70cm 4-way	37
900-2way (combiner)	ask
900-4way (combiner)	ask
1268-2way (combiner)	65
1268-4way (combiner)	95
1296-2way (combiner)	85
1296-4way (combiner)	95
1691-2way (combiner)	65
1691-4way (combiner)	95

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MF4H-48 MBM48 Hor	\$ 89
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SPECIFICATION	MBM28	MBM48	MBM88	10XY	5XY-137	DY-20-900
FREQUENCY (Mhz)	430-440	430-440	430-440	144-146	134-138	900-930
GAIN (dbd)	11.5	14.0	16.3	10.8	7.8	17 dbi
FRONT TO BACK RATIO	18 db	20 db	22 db	16 db	20 db	20 db
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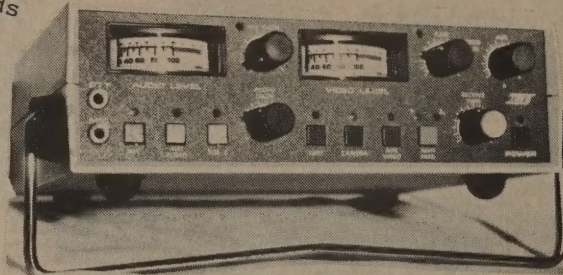
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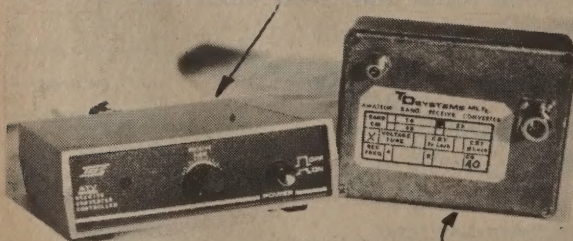
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The Clipping Action. One Item That Can Be Added At This Point
Is A Small Sync Stretcher PC Board That Mounts On The CU.
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Drives The Processed Video Down The Coax To The Transmitter.
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OCTOBER 1989
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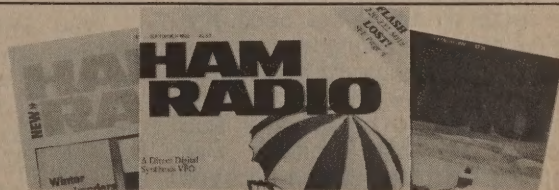
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The w6ORGy Notes

By Tom O'Hara, W6ORG

BEHOLD! ATV'S TIME HAS COME.

The prophesy I made in the last issue is coming true (Future Shock pg. 42). ATV has really taken off. August is typically the least active month with people putting their time and money into vacations and/or getting ready to send the kids back to school. However, sales were the highest in our history and 2.3 times any previous August. Hams are finding all kinds of different and interesting things to do with ATV as well as infecting their friends with the bug. Many new ATV repeaters went up this summer.

RF CONCEPTS 100 WATT AMP IS NOW ATVIZED.

I have been working with Ken Holladay K6HCP, RF Concepts - Kantronics amplifier engineer, since just after Dayton to upgrade the rfc4-110 and 4-310 amps to work on ATV. It took the usual number of caps on the bias and collector voltage lines, but some of the ferrite bead RF chokes had to be changed to remove the color, sound, and high frequency distortion. The bias dropping resistors had to be lowered also because the bias voltage was dropping out of regulation on sync tips.

The values were quite critical. The chokes had to be high enough in value to prevent low frequency oscillations from blowing the driver or finals (I made one driver transistor into a crispy critter), but low enough, up to 5 MHz, to allow the capacitors to keep the supply voltages from loading down.

Kantronics-RF Concepts Director of Marketing Everett Gracey WA6CBA says that all amps shipped after November 1 will have the ATV upgrade, and those that have one that was made before then may get it converted for about \$30. However, call Kantronics to get authorization and actual cost before you ship yours to them.

The rfc4-110 has a built-in preamp that helps overcome the usual T/R relay insertion loss in receive. In addition to the 170 degree over temperature cut out,

there is a high VSWR detector that will switch off the amp to protect it.

The amp is biased more toward class A than most class AB linear amps found in the amateur market which accounts for the 6 Amp idling current. Therefore DC efficiency is very low until high output is reached, and a higher current capable power supply is required. Video linearity is good up through 60 watts out, after that sync stretching is necessary to maintain sufficient video to sync ratio. The amp would key up with as little as 100 milliwatts, and 1.5 watts p.e.p. (sync tip) gave just under 50 watts output.

N	OUT	dB	Amps	Eff%
.1	7	18.5	6.5	8
.2	10	17	8	9
.45	20	16.4	11	13
1.1	40	15.5	16	18
2	60	14.8	20	22
4	80	13	23	25
8	100	11	26	28

The rfc4-110 was designed primarily with multimode 10 watt rigs in mind. The 4-310 is the same amp, without the driver stage, intended for the 25 to 30 watt out rigs. There is also the 4-32 which was made for HT's and up to 3 watts in and 20 out. This amp did not need any modification and in fact has been working great in my helicopter for over a year now. I drive it with a TC70-1 and am getting about 16 watts p.e.p out for 1.5 in.

ATV SOUND PEAKER WORKS IN WORST CASE FIELD TESTING

I wanted to give the sound subcarrier peaker a real test to see if it would hold up under the tightest scrutiny (see pg.40 July 89 issue). Who else but Henry (if anyone can blow it up, I can) Ruh KB9FO was selected. Henry connected it up between his downconverter and Radio Shack portable TV and took it mobile. He told me it did indeed pull out the sound and even pumped up the color at the same time in snowy pictures where previously there was no color or sound. Here is the solution for those with TV's that don't

get best picture with best sound in snowy conditions.

VOYAGER-NEPTUNE VHS TAPE IS FREE

JPL has made available a copy of their Neptune Encounter Highlights tape. All you have to do is send one sealed VHS tape to: Peter McClosky, JPL Teaching Resource Center, CS-530, 4800 Oak Grove Drive, Pasadena CA 91109.

When you write for the tape make sure that you say that you are an amateur radio operator and that you want the tape to show over amateur television to other hams in your community. The tape runs 30 minutes and contains animations as well as actual Voyager images.

The Highlights were also sent over Satcom F2R Transponder 13 Oct. 2 at 1 pm Eastern time. It was recorded and sent that week on the So. Calif. ATV nets. It will probably be shown again later on NASA Select.

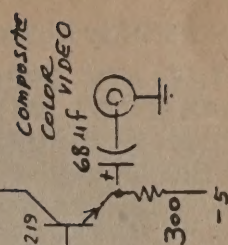
RGB TO COMPOSITE VIDEO CONVERTER

The question of how to take a RGB output from a computer and put it into a standard NTSC monitor or into an ATV transmitter comes up occasionally. Elmer Thomas WA6PFA has been using this circuit (see schematic) for over 10 years to put computer graphics on the air and use lower cost composite video monitors.

This circuit takes 7 IC's to convert the red, green and blue signals to composite color video. 96L02 one shots keyed from the green signal enable the 3.58 MHz color burst. The 4 high speed FET op amps, LH0062's, mix the three colors in the proper ratios and provide luminance and sync to the LM1889 TV Video Modulator.

The LC tank circuits that would normally make this IC into a RF modulator are jumpered out so that the output is just the mixed composite video which is fed to an emitter follower. Regulated + and - 5 Volt DC supplies are required.

Diagram of a color burst generator circuit. The circuit consists of two stages, each using a 50K resistor and a 500PF capacitor. The first stage is labeled "FOR COLOR BURST POSITION" and the second is labeled "FOR COLOR BURST WIDTH". The circuit is powered by a +5V supply. The output of the first stage is connected to the input of the second stage. The final output is labeled "COLOR BURST WIDTH".



THE ATV SPECTRUM BAREFOOT, WITH AMP, AND WITH VESTIGIAL SIDEBAND FILTER.

Here is a comparison of what the worst case spectrum looks like with a DSB and a low level generated VSB 1 watt transmitter, a Mirage D26N added to them, and a Spectrum International PSF434-ATV VSB filter added to the combination.

The FCC standards for a Vestigial sideband AM video low power transmission can be found in Part 73. The graphs are in 73.699. None of the present ATV transmitter outputs run barefoot, and especially with an amp, meet the technical definition without a filter in the antenna line.

Basically the LSB video at and below 1.25 MHz from the carrier has to be -20 dB and the LSB color subcarrier -42 dB (73.687). Any modulation components above +4.75 MHz from the carrier must also be down -20 dB.

This is fairly loose, but there is a catch-all that says more may be needed if interference occurs. Some of the LPTV transmitters can maintain the linearity necessary to meet this spec without an output filter (of course they cost in the \$10,000+ area) but are required at electronic sites to prevent transmitter final generated intermod.

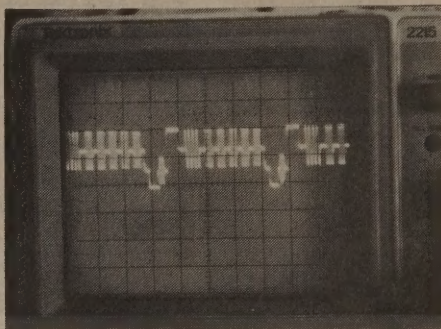
I think the same practical common sense approach should be done with Amateur systems. That is, each individual amateur should take the proper steps to insure that emissions, that have been proven to interfere with other users in their area, that are outside the normal 6 MHz video passband are sufficiently attenuated.

Each case is going to be different with different antenna patterns and polarity, obstruction attenuations, power levels, what is in the video picture, sideband intermod and harmonic product levels, etc. It has been my experience that filtering has been necessary if there is another mode user within 5 miles, more if on a hill top, less with any of the natural attenuators.

There have been complaints at hamfests, but with everyone with at least 1 HT on their hip, it is ridiculous to expect any clear channels with all

the close by power and intermods. However one should use the minimum power to do the job, and select a frequency that will cause the least problem.

I would suggest that hamfest organizations coordinate the frequencies, power, filter requirements, and placement of any one giving talks and demos that weekend as much as practical. I always use 426.25 and run 80 mW if I only have to get around the building, or I'll use 33 or 23 cm.



To see what the worst case spectrum would look like I used 100% multiburst video from a generator. This puts out a progressively rising burst of frequencies starting at .5 MHz and ending at 4.2 MHz. Normal video would be less modulation percentage and random frequency.

The HP8559 Spectrum Analyzer is set for zero dB at the very top at peak envelope power. Vertical major divisions are 10 dB amplitude and the horizontal major divisions are 5 MHz.

BAREFOOT

The P. C. Electronics TC70-1 has a double sideband transmitter but the modulation scheme has some phasing to reduce the LSB sound subcarrier. This one is down about 6 dB or -24 dBc. The AEA FSTV-430 has a low level SAW filter which cut the LSB sound subcarrier down to -36 dBc, the subcarrier level varies somewhat with the video gain in this unit.

Sideband second harmonics and IM on the TC70 is down 40 dB and 45 dB or better on the FSTV-430. This is pretty good if you compare the equivalent adjacent channel interference with a two tone IM test with SSB that is typically -30 dB

p.e.p. One can talk about dB's this and dB's that, but what does it all mean in practice?

So how far will a tenth of a milliwatt go (40 dB below 1 watt)? To a FM repeater receiver tuned to exactly 9 MHz (2 times sound subcarrier) from your video carrier, line of sight on a hill top, your same polarity beam pointed right at him will break his carrier squelch from up to 20 miles. Again, a worst case scenario. Last issue I went over some suggestions to avoid the worst case frequencies, and every case will be different.

WITH D26N AMP

Here the amplifiers intermod characteristics modify the relative levels of sideband energy. With the TC70-1 the LSB sound has come up to almost -20 dBc and the sideband second harmonics to -37 dBc. The FSTV-430 has also come up to these levels.

The TC70-1 puts out a little more than the FSTV-430, and drives the D26N a little harder into compression, but is close enough as a comparison to see that any amplifiers intermod component changes the actual spectrum. So the actual level given in the barefoot example is not simply the amplifier gain (15 dB) added but also 3 dB more from the amp intermod in this example and will vary with each amp, VSWR, and drive level.

The TC70-1 has an adjustable blanking pedestal clamp to reset for the amps high end power curve compression. The FSTV-430 has no adjustments for external amps and should be kept below the amps compression level.

WITH AMP AND VSB FILTER

For those that ask if a VSB filter is necessary on an inband repeater, take a look at all the sideband energy within what would be the receivers passband 12 or more MHz away with and without a VSB filter.

The filter knocks all the out of VSB components way down at the cost of a few dB of insertion loss. It must be put in the antenna line or else any following amplifiers intermod products will regenerate them.

AM VIDEO MODULATED SPECTRUM

P.C. ELECT. TC70-1

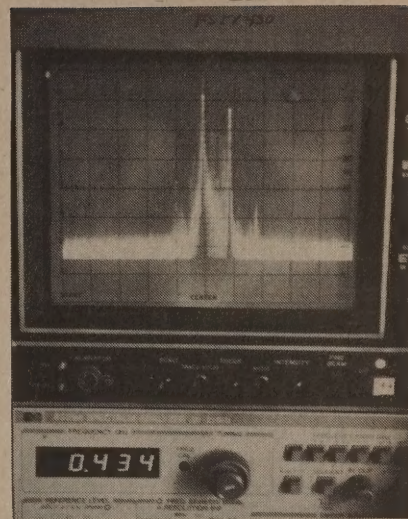
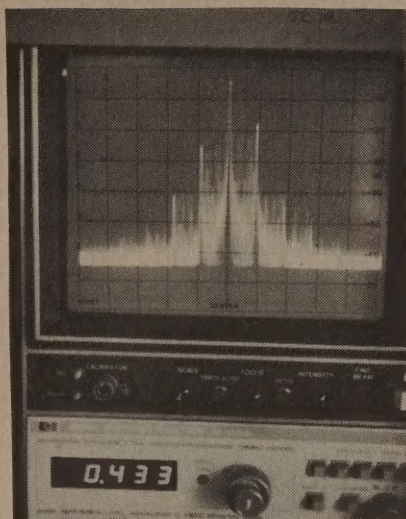
AEA FSTV-430

BAREFOOT

Each transceiver is connected to the power meter/dummy load through a directional coupler. The output of the directional coupler connects to the HP 8559 Spectrum Analyzer and is set for zero amplitude reference at it's peak envelope power. This is approximately 1.5 Watts for the TC70-1 and 1.0 for the FSTV-430.

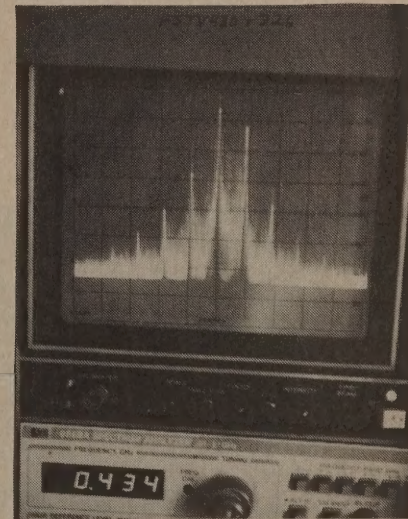
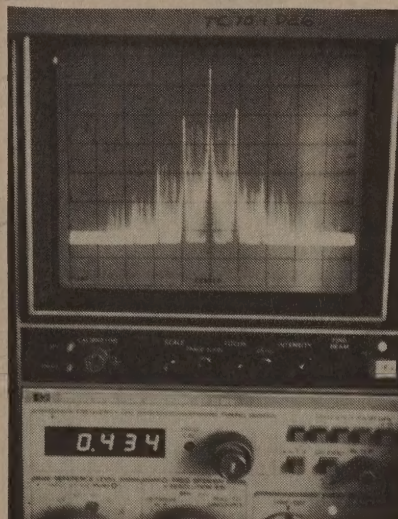
Vertical = 10 dB per major division.
Horizontal = 5 MHz per major division.

Each is 100% modulated with a video multiburst with frequencies from .5 to 4.2 MHz.



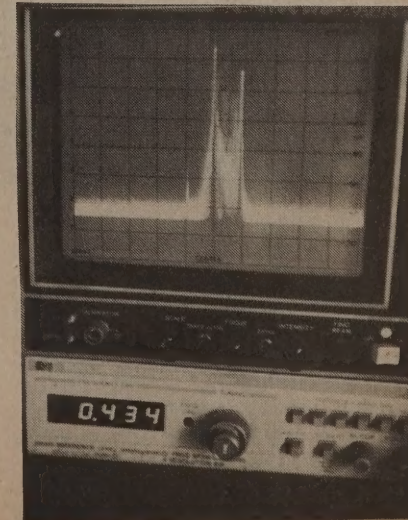
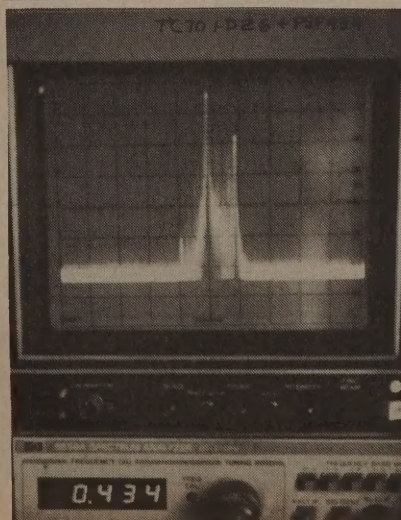
MIRAGE D26N AMP ADDED

Note LSB and both sidebands harmonics increases in amplitude with the added amplifier verses the transceivers by themselves. While the difference is more striking with the FSTV-430, the secondary sidebands due to the amps intermods peak power are about the same as the TC70-1 but average less.



MIRAGE D26N AMP FOLLOWED BY A SPECTRUM INTERNATIONAL PSF434-ATV VESTIGIAL SIDEBAND FILTER ADDED.

Both transceivers VSB spectrum are reduced way below the FCC definition. Also not shown is that the crystal oscillator or mixer and their harmonics are also reduced greater than 70 dB as well as the transmitter second harmonic.

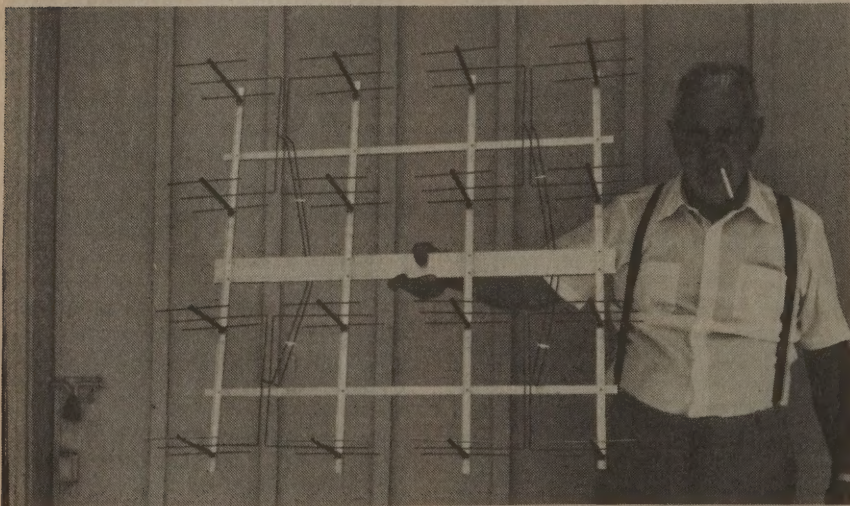


WHEN SHOULD YOU USE A VSB FILTER?

Other than when an interference problem arises, and at every ATV repeater, I suggest taking one along to any public service event, convention, or activity where there are going to be many other transmitters. Because other than the sideband harmonics and intermod, every amplifier that does not have a bandpass filter in the antenna line can generate IM products from all other transmitters on the air in the immediate area. Your ATV antenna picks up these signals and carries them to your amps final transistors where they do the mixing.

Two sources of ready made VSB filters are Spectrum International (617) 263-2145, and TX-RX Systems (716) 549-4700. If you want to try homebrew see page 41 of the April 89 issue of ATVQ.

BUILD THIS EXTENDED EXPANDED COLINEAR OR ELSE!



"Old Grouchie", as we call him, Austin Bennett K6YGX, is holding up two bays of 24 element 33 cm extended expanded colinears stacked together. The antenna is made out of 1/8" brass welding rod and hobby tubing. The 33 cm version shown here is a scaled up version of the 23 cm antenna built by homebrewers for many years.

The original 23 cm plans by Sam K6VLM have been floating around
PAGE 10

the Southern California gang in different forms. When the NU6X repeater came on 932.25 it gave the incentive to scale the antenna down. The single bays typically measure in the 17 to 18 dBd area.

NEW BLACK AND WHITE CAMERAS



The Uniden CCD cameras should be available by themselves as you read this. It has taken them a while to come out with them after the announcement at Dayton.

This is fine for the two way video intercom it was designed for, but you would not want it on the air.

I still think it might be just the ticket for the R/C people where low crash cost is more important than light sensitivity and resolution.

I just checked out the Koyo TVC-4000-2 camera. It uses a 2/3" vidicon and claims 600 line resolution. Sensitivity is speced at 8 lux with a f1.4 lens but for some reason the optional C mount lens listed for it is f1.6. By using both the lens and mechanical focus adjustments I was able to get all the way down to a few inches from a printed page.

Since this camera is made for surveillance, there is no on-off switch, you have to plug and unplug it. The sync is 2:1 interlace locked to the 60 Hz line. The composite video comes out a BNC connector. Price range for this camera is \$200.

I am still looking for color cameras in the under \$500 class, anyone find a source let me know so I can pass it on. 8 mm color camcorders have dropped down to under \$700 however.

ATV HAS COME ALIVE IN THE MILE HIGH CITY

Maryann and I stopped by Allied Appliance in Englewood, a suburb of Denver Colorado, on our way to visit relatives in Colorado Springs and crew for a friend at the Leadville 100 mile foot race last August. The ATV gang there seemed to be laying for us. Just after leaving the airport, I got on one of the local 2 meter repeaters and asked directions.

Dave NØHZY came right back with directions and another repeater to switch to, 146.64, that most of the ATVers use. 144.34 simplex is also used. Tim WBØTUB took a little time off work to come down to the store to say HI in person, and we saw and talked with Bob W6ORE, and Dave W6OAL, working on another antenna idea, through the ATV repeater.

The Denver NØIVN repeater is 426.25 in and 1253.25 out up on a hill on the west side of the city around 7,400 feet MSL.

The camera and monitor prices have also come down since then, around \$175 without sound (VM100) and \$205 with sound (VM200). Hopefully the camera only price will be not too much over \$100.

Unfortunately the one with sound does not lend it self to ATV transmission. It mixes a 6.5 MHz FM sound subcarrier on the video line. A receiver in the monitor detects it.

THINKING ABOUT PUTTING UP AN ATV REPEATER? HERE ARE SOME THINGS TO THINK ABOUT BEFORE SPENDING ANY MONEY

There is no denying the ego boost of being able to say that you put together a repeater, are the owner, or that it carries your call. And sure you will get a lot of verbal encouragement from the local ATVers for you to do it.

Most repeater owners or builders I have talked with over the years have told me their club or group at first was all for it with promises of money and help. But when it came down to it that help disappeared or each had different ideas about how it would be configured or placed. It usually ends up with one or two people doing all the work.

So the first thing I suggest is to plan it all out and then have everyone that is going to be involved have their part, whether it is building something, buying a part or just giving funds, defined on paper. Discuss it all and select a systems manager to see that everything comes together in a timely manner, and a technical manager who makes sure the right components are selected and go together properly. Have each person initial or sign for his part of the project so that there is no miss-understanding months later as to who was supposed to do what and when.

Things will change over the course of the project, and as they do the system manager can up date the tasks and keep everybody informed as to progress and what is needed.

When you nail people down like this you quickly separate the talkers from the doers.

The most important decision after you have all the players is to select the repeater site. Chances are that the highest and best coverage spot already has repeaters on it by other amateurs, business, government, etc. A meeting with the site manager or owner should be set up with only the system manager and technical manager to find out the rental costs, are there U.S. Forestry or BLM permits also required, what are the frequencies and power output of other systems that might be of interference potential, site access restrictions, technical requirements, antenna type and placement, coax or hardline length, rack space, etc.

Decide if you are going inband or crossband repeat and horizontal or vertical antenna polarization. Have a meeting with your areas frequency coordination council and discuss the alternatives with them. Coordination is done by site and it's area of coverage which has the most effect on interference probabilities. Keep it friendly and technical. It may take more than one meeting and some testing.

An inband will be the hardest to coordinate due to taking up so much spectrum. See last issue's column

about the different considerations in the 420-450 MHz band. Take it with you to the meeting. Remember you will need at least 12 MHz frequency separation in order for the VSB filters to do their job. I suggest 421.25 output and either 434.0 or 439.25 input.

Crossband has the benefits of taking only one channel on 70cm for an input, and leaving the other for simplex and DX. Low in and high out gives the most performance and least cost to your users because it is very easy to put a preamp at the antenna to save the higher feed line loss with frequency than a transmitter and amp. All existing ATVers will have a 70cm transmitter for simplex and DX and will just have to add a downconverter and antenna which is much less cost than a whole new transmitter and hard line. Equipment costs go up with frequency.

The other benefits are users being able to see their own video coming back for more accurate video gain, lighting, and focus adjustments and other testing when no one else is around. It is also easier to sell to the frequency coordinators. The optimum frequencies as far as harmonic relationship and other economic and coordination considerations is 426.25 in and 1253.25 out.

As you can see there are a lot of details to be worked and planned out before the first piece of equipment is bought. I generally tell people to plan on about \$2000 on the average before they have a good working machine, and not to just try to get by with what is in the junk box or could be thrown together especially if it is at a shared electronic site.

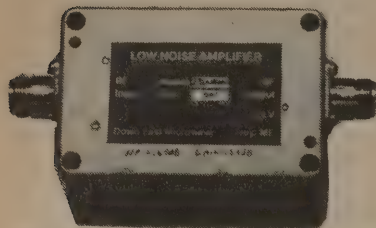
The biggest cost will be for the hard line, antennas, and vestigial sideband filters. These items will be of most interest to the site owner as far as physical placement and any technical requirements. The transmitter, receiver, power supply, VOR and ID are actually the easiest to place and take up the least room.

More next time on the joys of getting involved building a repeater. Call me if you have any specific questions or problems that I might help with.



The w6ORGy Notes Cont.

NEW ANTENNA MOUNTED PREAMPS FROM DOWNEAST MICROWAVE.



Bill Olson is the first that I know of to offer antenna mounted preamps for the 1200 MHz band. Besides the 23LNAWP he also has them for 900 and 400. I got serial number 001 to check out.

The MGF1302 GaAsfet is housed in a very hefty Rose Enclosures weather proof aluminum box. The cover seam has a rubber gasket in a groove to keep any water out.

Noise figure is specified at less than 1 dB and the gain at greater than 10 dB (mine was .65 NF and 13 gain).

The preamp is powered thru it's output coax with 8 to 18 VDC @ 20 mA. To protect against accidental coax shorts taking out a regulator, I suggest putting a 100 ohm resistor in series with the DC decoupling in the downconverter to limit the current.

This preamp came at the right time for me because I ran out of our antenna mounted downconverters and control boxes. The volume and present cost meant that I would have to have raised the prices significantly to make some more.

By using the standard downconverters at the shack, and this preamp at the antenna with 9913 coax you can get about the same improvement in receive sensitivity.

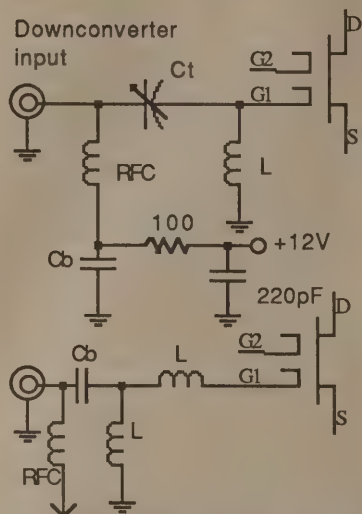
But the biggest benefit is that you no longer have to tweak the tuning a little to track local oscillator moving with the wide outside temperature changes, and you can operate it all at 12 Volts in the shack or portable instead of fixed at up to 18 Vdc.

The only drawback is for those who want to transmit on the same band through the same antenna. There is no T/R relay system built into this preamp. However it is not a problem for those areas that just need

to receive the output of a crossband repeater or duplex.

All three bands are available at the same price of \$95 from Downeast Microwave. Call Bill at (207) 9483741 and tell him ORGY from ATVQ sent you.

COUPLING DC UP THE COAX TO YOUR DOWNCONVERTER MODIFICATION



Most downconverters have a DC ground through a RF choke, coil tapped input, or even a resistor to bleed off any static buildup before it gets so high as to blow the preamp. To power the antenna mounted preamp, you will need to DC isolate the input from the preamp device and RF wise from the 12 volt source.

The above schematics show two examples of connecting the RFC, bypass cap (Cb) and resistor network to the preamp stage of a downconverter. The first one has a input series tuning cap and a stripline or wire RFC to ground. If there is no RFC to ground one will have to be added. Cut the RFC in this case on the ground side and connect the bypass cap with very short leads along with the rest of the network. The second one has an inductive tap on the input tuned circuit or a series inductor with a RFC to ground. In this case the cap (Cb) goes between the connector and board input pad.

The value of Cb will vary with the band in use. I suggest small disc ceramics of 10 pF at 1200, 33 pF at

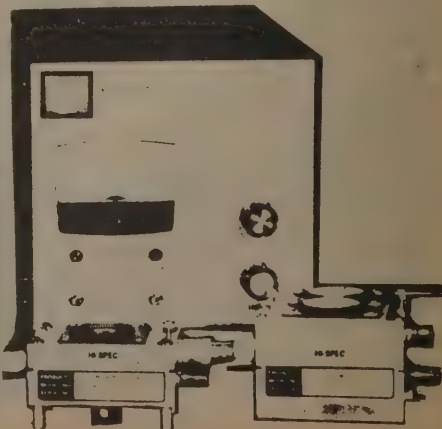
900, and 100 pF at 400 MHz. The RFC, if not already part of the downconverter can be made from 4 turns #24 wire .1" diameter close wound.

HIGH POWER AMPS

I have been bugging Bill Olson at Downeast to get me one of the 4 power module (Mitsubishi M57762) 70 watt 1200 MHz Amps ever since I saw the prototype at Dayton. But he has been too busy cranking out his other amps and loop Yagi's to ATVers that, at this writing, I have not received it. He promises it to me within the next month and I will report on it in the next issue.

I did ask him if he had any info and feedback on any other 70cm and up amps that I could pass along to ATVers. Bill regularly talks to UHFers all over the country and gets feedback just like I do from ATVers in the normal course of business. You might have seen Bill's articles in the ARRL QEX magazine for experimenters. He has been a regular contributor. I highly recommend this League publication by the way for the technical types and for keeping up on the state of the art and what's available.

I got an interesting flyer from HI-SPEC (POB 387 Jupiter FL 33468, (407) 7465031) showing the tube type amps they have for the 900, 1200 and 2400 MHz bands. These are 1 or 2 7289 triode tube amps available in just cavity form or complete RF Decks. They also have a matching power supply. The output powers go as high as 200+ watts. While I have not personally tested any of these, Bill says they have a good reputation.



CHANNEL 13 TVI?

If you divide 426.25 by 2, it falls within the passband of channel 13 (210-216 MHz). The amount of energy at this frequency in our transmitters is about 50 dB down from the output. But this is enough to be seen in some cases by your neighbors depending on antennas, placement and power.

The least insertion loss and lowest cost filter for your 70cm transmitter, if this is a problem, is a high pass. Insertion loss of 5 pole filter is typically a negligible few tenths of a dB. You could make one right out of the ARRL Handbook (1989 pg. 2-48 filter #65, divide values by 100) or use any of the 2 meter / 440 antenna duplexers.

These are simply high pass/low pass filters to a common connector. Cost is around \$50 (Yaesu AD-2, Comet CF-416, Diamond MX-72D, etc). Also they can be put on a 2 meter transmitter to cut down the 3rd harmonic that might be getting into your ATV receiver.

Broad 70cm bandpass filters such as the Spectrum International PSF432 would also work but at a higher cost. A VSB filter would kill everything not within the desired ATV passband but their cost is over \$150.

10 GHZ ATV ANYONE?

10 gig FM ATV Gunnplexers have been used for links at the Pasadena Rose Parade and just recently from JPL to the Griffiths Observatory during the Voyager - Neptune encounter. It allows getting video out of a hole when multiple hops are needed without taking up one of the primary used channels on the 400 MHz or other bands.

DX is strictly line of sight but you can get 10 or more miles easily with these systems. Greater DX is possible with the 100 mW Gunn diodes and larger dishes..

SHF Microwave Parts Co., run by Alan Rutz WA9GKA and his wife, have a variety of Gunn sources, antennas, power supply/audio modulator kits and a free book that comes with each order showing how to make a 10 GHz voice link. Nothing on his price list is over \$20! Drop him a note asking for his goodie list.

The higher power 100 mW Microwave Associates Gunnplexers are available from Advanced Receiver Research for almost 10 times the price of the 5-10 mW types that Alan has.

For more info on ATV with the Gunnplexers I suggest the Gunnplexer Cookbook, available from Ham Radio Magazines Book Store, as a starter. Surplus Satellite receivers with about 35 dB of gain added ahead of it works fine. I have on my design list a good FM receiver module made for ATV communications links and will get with Alan when the time comes.

CAN'T AFFORD A BIRD?

There are some new imported small portable RF power meters for under \$100 that might just be the ticket for those that don't want to invest \$200 for a good Bird 43 plus \$55 or more per slug just yet, but need something to set the blanking pedestal level on that new linear amp for ATV or want to make sure of the antenna system VSWR before keying down for a long winded QSO.



Comet has a series of Mini-meters that cover individual bands and switchable at 2 power levels. For instance the CM400N (\$67.50 list) covers 410 to 460 MHz and has a switch to give 15 or 50 Watts full scale. The 900 and 1200 models have 10 and 60 Watts full scale.

Most meters are least accurate at the low end, and this one is no exception. With 1 watt on my Bird, I read 1.5 on the Comet. To get more sensitivity with 1 watt transmitters when setting the pedestal, you can turn the meter around and double the indication. 1 Watt in this case read 3 watts on the Comet.

Actual power reading for pedestal setup or verifying a low VSWR is not as important as the relative reading for peak power indication. A double N male connector is handy to screw on

to the TX input side of the meter to use with the ATV transceiver or power amp.

There are Comet models for 900 to 940 MHz (CM900 at \$98.50 list), 1200 to 1300 MHz (CM-1200 at \$98.50 list) and one that covers 140 to 450 MHz (CM420N at \$82.95 list). These Comet mini-meters are imported by NCG Co.

Diamond has a fancier group of power meters, imported by RF parts, that I will report on next time. So far the meters just have SO-239 connectors, and I am waiting for the ones with N connectors. I did look at one with SO-239's that covered 140 to 525 MHz, 3 ranges - 5, 20 and 200 Watts full scale, and a switch to give average or peak readings. You can read actual power or a knob on the front enables setting the meter at full scale for accurately reading SWR. The model SX-400 lists at \$109.95.

CM VS MHZ

New ATVers are often confused when the bands that ATV is allowed on are called by different names. They may say they are on the 70 centimeter band, 400 meg band, four-thirty two, four-fifty, four-twenty, or just plain four-hundred. I don't know what is best as far as what should be written in this magazine.

Actually calling it by its metric/wavelength band is the best general description, but in use a specific frequency is more practical. I usually use the metric band description, but in this issue I am trying the lowest rounded off frequency.

To find the wavelength in meters you just have to take 300 and divide it by the frequency in MHz. Remember that one from your amateur test?

70cm	400	420-450 MHz
33 cm	900	902-928 MHz
23cm	1200	1240-1300 MHz
13 cm	2300	2390-2450 MHz
9 cm	3300	3300-3500 MHz
5 cm	5600	5650-5925 MHz
3 cm	10 gigs	10.0-10.5 GHz



Oliver NØJBK and Sharon NØJBG have a nice station setup in the store and is really excited with this new mode. It is not unusual to find them still at the store station after hours during the week or weekends talking ATV with those that drop in or come up on the air.

Oliver says they seem to pick up one or two new ATVers every week. Most of the gang is very helpful getting the new people going. The Western Vision Network gets together on Friday night, 8 pm on 146.64 and Tuesdays on 144.34.

This repeater might be a good DX opening beacon to the midwest since it is on such a high location with a good view to the east. While 439.25 simplex is the most popular in the midwest for DX, give 426.25 a shot and at the same time use 144.34 - you might get into the Denver repeater group.

KREEPIE PEEPIE AT 10,000 FT

John KB6MMF hiked all the way to the top of Mt. Baldy in southern California to send video back down to the bottom during the Annual Mt. Baldy Run To The Top race. He used a 1 watt KPA5 and 7 element beam. The race starts at the foot of the Mt. Baldy ski lift which is about 6000' and goes up on trails for 8 miles to the top at 10,064 ft.



I shot this picture off the screen of the finish line crew awaiting the arrival of the first out of breath runner. The DX is about 40 miles with a P3 to P4 picture.

I ran (read walk and crawled) the race last year and preferred sleeping in and watching my friends do it this time. I watched talked back to my running buddies on 2 meters and did get bad mouthed for being a couch potato this time.

John KB6MMF, Bud KB6MID, and Tony WB6QHB enjoy going out in the wild and doing the unusual public service event with ATV.

The last three years they have participated in the Angeles Crest 100 Mile Endurance run and have provided both two meter communications between check points to keep track of all the runners on the trails, but also video.

Video between the remote mountain aid stations was a big plus for the runners crew and friends to be able to see as well as talk to their runner.

This race goes from the ski area of Wrightwood at 6000 feet, over Mt. Baden-Powell (9300 ft.) and up and down other mountain trails for 100 miles ending at the Rose Bowl in Pasadena. The runners have 33 hours to complete the race and go continuously day and night. Some aid stations have to remain open over 12 hours.

By communicating the entry and exit times of each runner to the adjacent check points on 2 meters, all runners are accounted for in case one of them gets lost or injured. Search and Rescue is notified if any runner is reported injured, lost or overdue. Last year was especially hot and many runners suffered from heat exhaustion. Amateurs were able to cut the time down by hours that the individuals were found and

receive aid. One of the runners, a ham running with his HT, called in reporting another runner in serious trouble. A helicopter was dispatched and rescuers dropped down on ropes to pull the victim out from the remote mountain trail.

Video from remote aid stations also assist medical personnel to evaluate those who are having problems by seeing what they look like as well as the description of the problem from the aid station personnel.

NO AMATEUR VIDEO FROM THE PASADENA ROSE PARADE THIS YEAR?

At this time it is unknown if permission from the Tournament of Roses Committee will be given for the satellite feed to other amateur TV groups as was done last year.

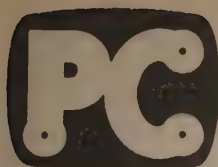
Dave WA6ZVE got 2 hours of satellite time last year that enabled many areas of the country to see the ATV operation at the Rose Parade. However, as with any big production, there is a lot of money and politics. The parade officials have to be very careful giving permission for a satellite feed for free with all of the US and foreign networks putting out a lot of bucks.

The hams have been providing ATV for the officials for 11 years, but this problem with the satellite feed opened up a ball of snakes. Those that have been with it all these years may not even participate this year because of the hassles.

If things get ironed out, it will be announced through some of the amateur newsletter media, or give me a call.

Keep the insides of your coax dry 'til next time, and as they say at the religious stations down near the border..videos con Dios amigos.

Tom O'Hara, W6ORG
2522 Paxson Lane
Arcadia CA 91007
(818) 447-4565



P.C. ELECTRONICS 2522 PAXSON LANE ARCADIA CA 91006-8537 USA

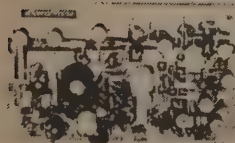
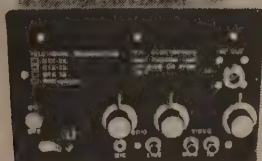
TOM (W6ORG) & MARYANN (WB6YSS) O'HARA

(818) 447-4565

ELECTRONICS

Did you know you can run full duplex or repeat with your 70 cm ATV system by simply adding a 33 or 23 cm system? Receive and transmit at the same time, crossband, without filters. You can get enough isolation usually with 10 ft antenna separation. How about a remote link to your base 70 cm station? Link weather radar or Space Shuttle NASA select satellite video to your local ATV repeater - there is a whole new world of personal and public service applications now possible.

NOW YOU CAN GO FULL DUPLEX ATV



NEW 1 WATT TV TRANSMITTERS for 33 & 23cm...\$299

TX-33 for the 902-928 MHz band and TX-23 for the 1240-1300 MHz band. Specify frequency: 910.25 simplex or repeater input, 1289.25 simplex, 1277.25 repeater input are most common. Novices now you too can get on ATV with the TX-23. > 1 watt p.e.p. with adjustable blanking pedestal for proper setup with Downeast amps. Built in T/R relay with BNC output to same band TVC- xG downconverter. Independent controls for mic and line audio. Push to look. 10 pin VHS camera connector plus video & audio input RCA phono jacks on back for any other camera, camcorder, VCR or computer video switch selectable from the front panel. Video monitor output has actual detected modulation in transmit for accurate adjustment of video gain, & camera video in receive. Req. 13.8 Vdc @ .5A. + camera current. 7x7x2.5" shielded cabinet. RTX-33 & RTX23 versions in dicast aluminum box without T/R relay also available.

TXA5-33 1 WATT ATV TRANSMITTER BOARD.....\$139

This wired and tested 33 cm board is for those who want to package their own system. Requires FMA5-E (\$39) for sound subcarrier & 13.8Vdc @ 500mA. 3"x5".

TR-23 module gives low loss T/R antenna switching between TXA5-33 & TVC-9. \$29

DOWNCONVERTERS FOR 33 & 23 CM:

TUNEABLE READY TO GO in 4x2.5x7" shielded cabinet with 120Vac to 12Vdc wall plug power supply. All our downconverters have GaAsfet preamp and mixer.

TVC-9G 902-928 MHz to ch 2, 3, or 4.....\$99

TVC-12G 1240-1300 MHz to ch 7 or 8.....\$109

CRYSTAL CONTROLLED in dicast aluminum box, requires external 11 to 15 Vdc.

TVCX-9 specify input 33 cm frequency and output on CH 3 or IF.... \$139

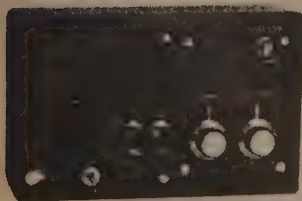
TVCX-12 specify input 23 cm frequency and output on CH 8 or IF.....\$159

WIRED AND TESTED BOARDS for those who package their own systems

TVC-9 varicap tunes 902-928 MHz to open channel 2, 3, or 4 in your area\$59

TVCX-33 crystal controlled specify 33cm input and CH 3 or IF output freq...\$109

TVCX-23 crystal controlled specify 23cm input and CH 8 or IF output freq. ..\$129

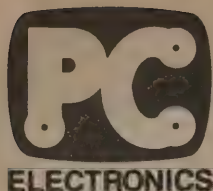


TONNA 20923 33CM YAGI ANTENNA 23 ELEMENT 16.3 dBd.....\$67
8.3ft boom. 50-ohm type N male cable.

TONNA 20623 23CM YAGI ANTENNA 23 ELEMENT 16.3 dBd.....\$67
5' 10" boom. 50 ohm type N male cable.

ATVR-x ATV RECEIVER ready to go in dicast aluminum box use for link or repeater. Outputs: 2 composite videos to drive monitor and transmitter, adjustable squelched line & speaker audio. 13.8Vdc @ .3A. Contains TVCX-xx xtal conv and VRC45 45.75 MHz IF/receiver (\$99) modules. Specify: ATVR-4 input on 70cm....\$299
ATVR-9 input on 33cm...\$309 ATVR-12 input on 23 cm band...\$329

5/89



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TC70-1 TRANSCEIVER

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MENTIONING THIS AD AND WE WILL SHIP UR TC70 UPS 2nd DAY AIR FREE WITHIN 24 HOURS!**
WITH OUR TC70-1 ALL-IN-ONE BOX ATV TRANSCEIVER, YOU TOO CAN EASILY TRANSMIT LIVE ACTION COLOR VIDEO
& SOUND JUST LIKE BROADCAST TV TO OTHER AMATEURS, SO SMILE FOR THE CAMERA!

TC70-1 SPECIAL FEATURES:

- Sensitive GaAsfet converter tunes 420-450 MHz with 25 dB gain
- Two frequency >1 watt p.e.p. transmitter properly matches linear amps with adjustable internal sync stretcher & blanking level set
- 4.5 MHz broadcast standard sound subcarrier, full 25 kHz dev.
- 10 pin VHS color camera and RCA phono jack video inputs
- PTL (push to look-same as push to talk for video) T/R switching
- Transmit video monitor outputs to camera and phono jack
- Small attractive shielded cabinet - 7 x 7 x 2.5"

Just plug in your camera, VCR, camcorder, etc. composite video and audio (10 pin jack on front or phono jacks on back), 70cm antenna, 12 to 14 Vdc, and you are ready to transmit live action color or black and white pictures and sound to other amateurs. Sensitive downconverter tunes the whole 420-450 MHz band down to input to your TV set on channel 3. Specify 439.25, 434.0, 427.25 or 426.25 MHz transmit frequency. One crystal included, second crystal add \$15.

*Transmitting equipment sold only to licensed radio amateurs verified in the Callbook for legal purposes. If newly licensed or upgraded, send copy of license. Receiving downconv. available to all starting @ \$49 (TVC-2G).

WHAT ELSE DOES IT TAKE TO GET ON ATV?

Any Tech class or higher amateur can get on 70cm, novices now on 23cm ATV. Any video camera, camcorder, VCR or computer with a composite video output can be plugged into the front panel 10 pin VHS jack or rear panel phono jacks for both audio & video.

DX with TC70-1s and KLM 440-16X antennas line of sight and snow free is about 22 miles, 7 miles with the 440-6X normally used for portable uses like parades, races, search & rescue, damage assessment, etc. For greater DX or punching thru obstacles add either of the ATV compatible 15, 50 or 70 watt amplifiers listed below.

The TC70-1 has full bandwidth for color & sound, like broadcast. You can show the shack, home video tapes, computer programs, repeat SSTV, weather radar, or even Space Shuttle video if you have a home satellite receiver. See the *ARRL Handbook* chap. 20 & 7 for more info & *Repeater Directory* for local ATV repeaters.

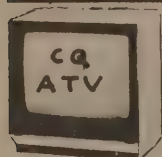
PURCHASE AN AMP WITH THE TC70-1 & SAVE!

50 WATT WITH D26N-ATV....\$529

70 WATT WITH D100ATVN....\$629

COMPLETE 70CM ATV STATION

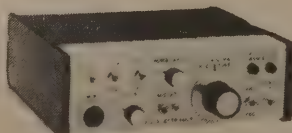
9/89



YOUR TV SET

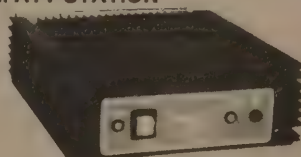


YOUR HOME TV CAMERA



TC70-1...\$329
ATV Transceiver
>1 WATT P.E.P.

13.8Vdc
Pwr. Sup.



Mirage D15N....\$155
(optional) 15 watts RF out.
Mirage D26N....\$219
(optional) 50 watts RF out.
Mirage D100TVN...\$319
(optional) 70 watts RF out.



KLM 440-16X 14dBd \$119
KLM 440-10X 11dBd \$65
KLM 440-6X 8.9dBd \$51

HAMS! Call or write for our full line ATV catalog...Downconverter boards start at \$49

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SURVIVES 100,000 FT. FALL

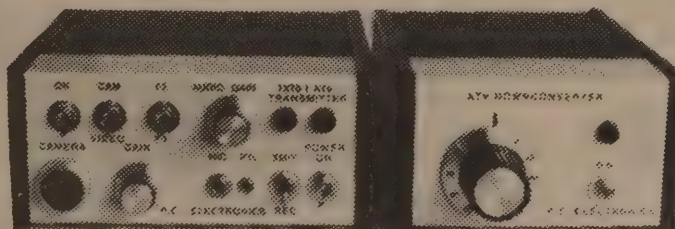
KPA5 1 WATT ATV XMTR ON 434 MHZ WORKED PERFECTLY IN WB8ELK LIVE CAMERA BALLOON THROUGH 100,000 FT AND BACK TO CONTINUE RUNNING EVEN AFTER FREE FALL IMPACT IN THE MOJAVE DESERT! VIDEO SEEN FOR 300 MILES.



KPA5-E board \$169

Shouldn't your ATV transmitter be as reliable? Weather you want to put one in a balloon, R/C model, Robot, use as portable ATV xmtr, or get one in our ready to go TX70-1 for the shack, with P.C. Electronics you see the best! Companion receiving downconverter board TVC-2G \$49, or ready to go in a cabinet - TVC-4G \$89.

TX70-1 XMTR \$259



TVC-4G RECV CONV. \$89

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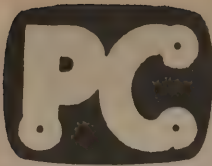
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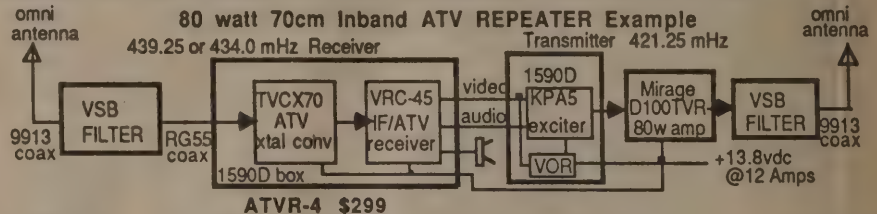
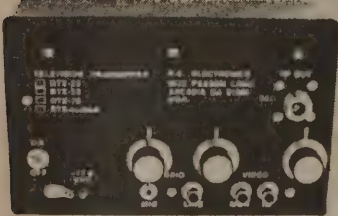
**Tom (W6ORG)
Maryann (WB6YSS)**



ELECTRONICS

BASIC ATV REPEATER or LINK SYSTEMS

Package your own 80+ watt inband repeater system using the modules listed in the block diagram below or go crossband by connecting up the RTX-33 or 23 transmitter and ATVR-x receiver. Crossband saves one 70cm channel for simplex and enables seeing your own video coming back. 33 and 23 cm omnis are available from NCG Co. [call Bruce: (714) 630-4541] and linear amps from Downeast Microwave [call Bill: (207) 948-3741]. Best performance is with the repeater input on the lowest band. Low loss vestigial sideband filters are available from TX/RX Systems [call Jon: (716) 549-4700].



ATVR-4 \$299
ATVR-4 ATV RECEIVER ready to go, specify input frequency on 70 cm band. \$299
Outputs: 2 videos, adjustable squelched line & speaker audio. 13.8Vdc @ .3A.
Contains TVCX-70 xtal conv (\$99) and VRC45 45.75 MHz IF/receiver (\$99) modules.
ATVR-9 input on 33cm...\$309 ATVR-12 input on 23 cm band...\$329

VOR-2 VIDEO OPERATED RELAY. Detects horizontal sync to key repeater...\$45
Has 10 sec signal dropout delay and 9 minute continuous signal external video ID timers. Also great for home station auto ID. Use with Elktronics VDG-1 video IDer and color bar gen board, both fit in Hammond 1590D box. Contact Bill WB8ELK directly for more info and purchase of the VDG-1 (\$89) at (419) 422-8206.

RTX 1 WATT REPEATER OR LINK TRANSMITTERS FOR 33 & 23 cm. \$299
Specify RTX-33 (923.25 typ.) or RTX-23 (1253.25 typ.) frequency. 13.8 Vdc @ .5A matches Downeast amps. Video and audio adjustable inputs, monitor video out.

NEW UNIDEN VM200 BLACK & WHITE CCD TV CAMERA / MONITOR / INTERCOM SYSTEM.....\$259
Use as low cost repeater site or home security/intercom system, or on ATV as an ID camera. Runs on 12 Vdc, AC adaptor included. Connect to home VCR for security application or to your TC70 (or any of our transmitters) for ATV. 4.8" monitor. Camera CCD has 19440 Pixels, size is 4.8x4x2.2" - might be small enough for larger R/C models.

KLM BROADBAND ANTENNAS FOR ATV

440-6x



KLM 440-6X has 8.9 dBd gain, vertical or horizontal polarization rear mount on a short 28" boom. Ideal for point to point, fixed at a repeater or small enough to be portable at public service events to minimize multipath ghosts and get some gain at the same time. Wide 60 degree beam width.\$51del

KLM 440-10X has 11.2 dBd, 64" boom. Rear Horiz or Vert mount same as 440-6X, just longer for a little more gain and multipath rejection.....\$65del

NEW KLM 440-16X replaces the 440-27 - same 12 ft boom length and full 70cm bandwidth but more rugged. Measured more than 14 dBd at 1989 West Coast UHF Conference. As with all 3 KLM antennas the 50 ohm balun is included, type N female connector.....\$119delivered

ATV antennas must have broad bandwidth in addition to high gain and low VSWR. Few other antennas work well at both 439 and 421 mHz. The three KLM antennas listed here fit the requirement and have a long history of rugged operation with ATVers. The gains listed have been proven out at VHF/UHF conference antenna measuring contests, they are not marketing hype. All KLM antennas listed here take up to the maximum legal power limit. Balun or matching network with female type N connector included. Price includes UPS surface shipping anywhere in the contiguous USA.

AEA .450 ISOPOLE OMNI 4 dBd GAIN ANTENNA. 50 ohm type N female feedpoint. DC grounded...\$89del
High efficiency decoupling cones puts all the RF on the horizon where it counts. Mounts on 1 1/4" dia masts. Works great for local ATV or FM simplex roundtables, portable/ public service/ Kreepie Peepie system, & repeaters.

del=delivered via UPS surface shipping in cont. USA.

July 89.

75 OHM HARDLINE COAX MATCHING SECTIONS

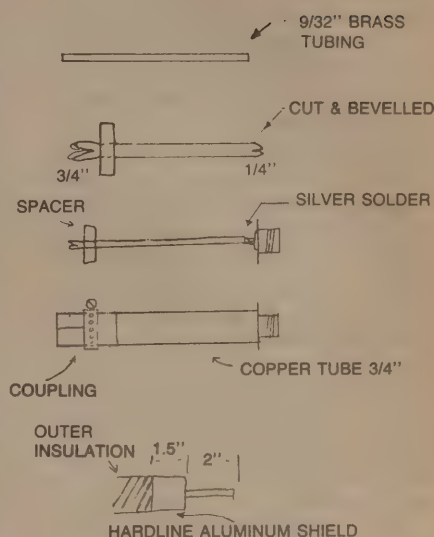
Paul W8ZD has developed a very high quality set of matching sections for easy connection to 75 ohm CATV hardline. First a 9/32" brass tube is cut to the desired length for the band desired using the formula $246/f(\text{Mhz})$. Using a Dremel tool with the cutting disk make two cuts at 90 degrees to each other into the end of the tubing. Cut 1/4" into one end and 3/4" into the other. Round the cuts to form four fingers on each end. On the end with the 1/4" fingers bend these so that they make a tight fit over the center pin of the back of a silver 'N' connector. Silver solder together using a small brazing torch. (Note: Use only Silver N connectors with Teflon insulation, or the plastic N connectors will melt!) Next cut a 3/4" copper pipe to a length 1/8" longer than the inner brass tube. Silver solder this pipe to the base of the N connector.

Using a pipe cutter cut a piece of center insulation from a piece of 7/8" hardline. Make this piece about 3/4" wide to form a compression spacer for the next step. With a small reamer widen the hole on one end of the spacer taking care not to widen the hole at the other end. Using a piece of 3/4" copper tubing pound the spacer into the end to cut it's diameter down to 3/4" and remove it from the pipe. Also make a small notch in the outer edge of the spacer to allow for moisture to drain out of the finished section. The spacer is then placed into the end of the matching section allowing about 1/8" of the fingers on the center tube to protrude be-

yond the spacer. Bend the protruding fingers back slightly against the spacer. This arrangement allows a tight connection with the center conductor of the hardline. One major problem with long runs of 75 ohm hardline is that the center conductor is aluminum and will contract enough in cold weather to break connection with the coax connector. This is not a problem with this section since the center conductor can move in and out several inches with no loss of contact!

Make four cuts evenly spaced into one end of a 3/4" to 3/4" inch copper coupler. Silver solder the other end over the end of the matching section. Place a hose clamp over the cut part of the coupling. Paint the outside of the matching section and let dry. Now expose 2 or more inches of the inner conductor of your hardline. Also remove the outer insulation or coating surrounding the aluminum shield back 1.5". Make sure the shield is cleaned well to remove any plastic coating. Slide the matching section over the hardline and tighten the hose clamp. Cover the whole works with COAX SEAL and you're ready to work those rare DX stations!

For those who would like ready made sections for any band between 2 meters and 1.2 Ghz, Paul will make them available for \$27.50 a pair for 2 meters and \$25.00 a pair for the higher bands. Please include \$4 for shipping. Also with the appropriate adaptor rings these can be made for any size hardline! Contact Paul Darwactor - 605 Balsley Ave., Findlay, Ohio 45840



Newsletters Wanted

Does your ATV club publish a monthly newsletter? Some clubs send newsletters to non-members at \$4 or \$5 annually. I would like to have yours. Send the first copy and I will send you the fee. Thomsa H. Earnest, W5UFO, P.O Box 603, San Angelo, Texas 76902.

CHROMA-KEYING WITH THE ARCHER SPECIAL EFFECTS GENERATOR

BY KD0LO JOHN P. SPAETH SPECIAL TECHNICAL RESEARCH BY KA9TGX JEFF KERSSEMAKERS

For those of you who have modified the Archer SEG as outlined in the January 1989 issue of ATVQ, here is another modification which is sure to fluff your feathers !

Chroma-keying is the process of switching between two video sources at specific points during the active video scan, by using color components of the picture to generate the key or switching signal. To back up for a moment, you will remember that a key signal is generated so that a hole can be cut into the active scan during a specific horizontal and/or vertical position. If the switching signals used to cut this hole are "in sync" or genlocked to the source video, then the hole can be made with sharp and smooth edges, anywhere during the active horizontal/vertical scan.

These holes can be filled with shades of grey or solid colors. A good example of this is the genlocked character generator. One can feed a composite signal into the generator, and the characters can be seen superimposed over the source video. This is done by using a high speed switch that switches between source video and grey tone at a very rapid rate specifically line and/or field rate. The characters are not actually over the source video but rather holes are cut into it which are shaped like letters.

The pulses used to turn this high speed switch on and off are called key pulses. These pulses can be thought of as digital in nature, that is, either on or off. Imagine that if the key pulse to the video switch were off the switch

would pass source A video. If the key pulse were logic high or on, the switch would pass source B video.

At any given point of the active scan on the crt, the switch must make a decision whether it will display A or B video. Keep in mind that both video sources are genlocked, so that when the switch displays one or the other, the video monitor will only see differing video content during the active portion of the scan, but blanking from either source will look the same to the monitor because they are synchronous. That is why the monitor does not jump or flicker during these rapid switching intervals.

As you know by now, the archer special effects generator (SEG), is a high speed switch. It also generates the key signals mentioned above. After modifying the unit to accept two video signals, the SEG will wipe or mix between the two using the internally generated keying signals. Even though these key signals are thought of as digital, they are not necessarily square wave in terms of duty cycle. Although a square wave of a particular line and field rate will produce a keying signal which will cause the switch to gate the video sources in squares and rectangles as in case of split screen and corner inserts, a triangular wave would gate the video sources in triangular shapes. The Archer SEG does both of these.

Imagine feeding the switch a wild and crazy combination of square, triangular, sawtooth, and parabolic pulses each having definite on and off point. The net effect of this

would be the creation of a bunch of irregularly shaped holes cut into the A video source with B video being inserted in them. If these irregular waves could be assembled and generated with some intelligence, these video "holes" would take on almost any shape even the figure of a human being like an ATV operator (some of the most irregular shapes known to mankind).

This tutorial has led us to one of the most exciting special effects in video, heretofore available only for commercial use at commercial prices, chroma-key. As I stated earlier chroma keying uses color information to generate key pulses. The chroma-key system uses only blue video information to generate key pulses. A basic chroma-key is shown in Figure 1.

Although any color can be used to generate key signals, blue and green are typical. These are high saturation colors and blue tends to interfere less with flesh tones than any other color. As seen in the diagram, camera A is aimed at the foreground with a blue backdrop. This video is sent to the video in A jack of the SEG, and also to the RGB decoder. Camera B is sent directly to the Video in B jack, of the SEG.

The Blue output from the RGB decoder is further processed by a key pulse generator circuit which we will discuss a bit later. This circuit will generate key pulses used to switch to video B whenever the blue background is encountered during the active scan portion of the picture. By doing this the blue background of video A is completely cut out of

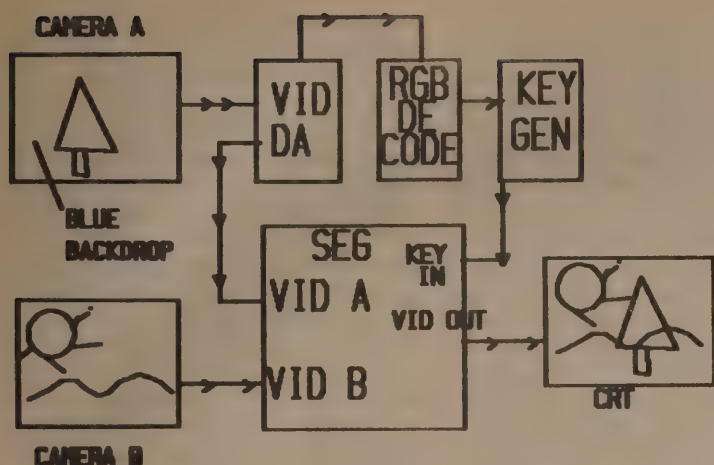


FIGURE 1 CHROMA-KEY INTERCONNECT

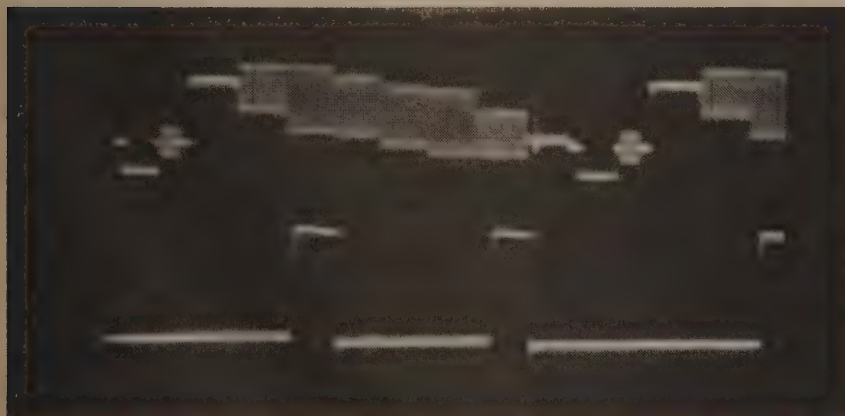
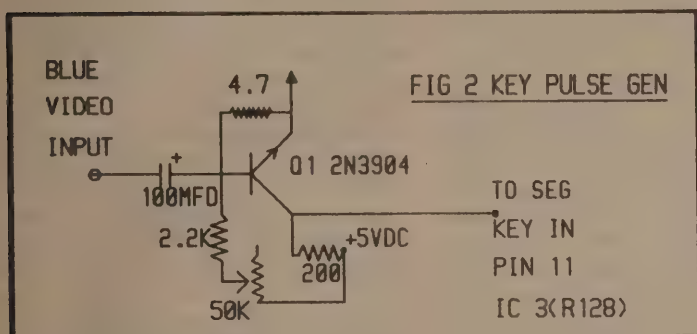


FIG 3 UPPER TRACE IS INPUT TO RGB DECODER,
LOWER TRACE IS KEY PULSE OUTPUT

the picture, and video B inserted in its place. This is how your local tv weatherman shows you those large maps of the dark clouds over Iowa. The area he is pointing to is actually a large blue square and the SEG is Chroma-keying a weather map as the source B video.

Before we go further, here are some things to keep in mind. The color blue you select for your background must be a bright blue, evenly hued, and non reflective. A painted surface is fine but it must be a regada blue as photographers often use for backdrops, or a bright shade of royal blue, and use flat paint. Also the backdrop lighting is MOST IMPORTANT. Hot or warm lighting spots will cause your camera to encode other than a true and uniform blue. For instance hot lighting spots caused by uneven lighting or a reflective surface will be interpreted by your camera as being of a higher luma value, and the RGB decoder will assign it a higher blue value than the actual blue you are using! This will cause keying errors based on luminance values rather than chrominance values.

Commercial chroma-keying often uses the blue output from an RGB camera. While many of us have color cameras, few have RGB output available from them. Fortunately, the computer craze of the 80's has given us a plentiful supply of composite to RGB converters. This will take the composite video from your camera and separate it into RGB analog signals. This method is more prone to error than using a RGB camera, but seems most appropriate for ATV resources. The RGB decoder which is

most easily obtained and the one KA9TGX and myself have used is manufactured by Sunrize Industries and distributed by many computer dealers. This unit is advertised regularly in publications associated with the AMIGA computer. I have also used some surplus decoders which work equally as well.

The interconnect system as shown in FIG 1. uses only two video sources. The A source is used to generate the foreground video and the key pulse video from the blue backdrop. The B source is used to generate the background fill video. This type of interconnect is known as a self key video system. To insure proper levels, a distribution amp should be used at the output of video A. One output going directly to the SEG video A input jack, and the second output going to the RGB decoder. The blue output of the RGB decoder is routed to the circuit in FIG 2.

The output of the key pulse generator in fig 2 is routed to pin 11 of IC 3 in the Archer SEG. A convenient tap point for this connection is the low side of pull-up resistor 128. No further modification to the SEG is required (other than that already described in January 1989 ATVQ).

When building the key pulse generator as in Fig 2, exact part values should be used. The operation of the circuit is quite simple. Blue output is fed to the base of Q1 through shaping capacitor C1. Q1 is biased through a voltage divider comprised of R2 and R3. R3 is used to set the "key level" to the SEG. Q1 is biased so that only decoded blue level peaks key the switcher.

Circuit operation is

straight forward but adjustments are somewhat critical. Once again, it is extremely important to use a saturated and bright blue for a background with even lighting on both the foreground and background. Once this is achieved, and connections are made as in Fig 1, adjust the Sunrize RGB decoder so that the saturation and hue controls are in the mid range position, the RGB switch is in the "B" position, and R3 is in its mid range position. The SEG should be set to the manual position with one of the wipe arrows engaged. The wipe direction indicator should be in the H/V position. The manual pot should be fully clockwise. At this point an NTSC color bar pattern generator should be substituted for camera A. Adjust R1 so that a key pattern just appears. At this point camera B video will begin to appear mixed in with the color bars. Adjust R3 so that the keyed video from camera B only appears where the blue color bar would normally be. If random key noise appears in the picture, turn the saturation control on the decoder counter clockwise. For most levels of blue this pot will be fully counter clockwise. If the edge transition appears soft, increase the video gain to the decoder (a pot may be inserted in the loop through video jack of the decoder to adjust the gain to the decoder board R3).

If NTSC color bars are not available, the unit may be adjusted by using the same procedure, but with the system interconnected to camera A as outlined above.

If no response is available from the system the output of the key pulse generator can be compared

with the photo in fig 3. The upper trace shows the input to the decoder board. The lower trace shows the output from the key pulse generator. Note how the pulse is generated only during the active scan portion of the blue color bar (second from right).

KA9TGX is using the same interconnect but substituting an op amp to generate the key pulses. This is a good idea and works well however we have noticed that with an op amp slew rate of 70 v/us, a delay was noted in the key pulse generator. This delay was as long as 3 us and could not be tolerated. The result was a blue edge transition on the trailing edge of the scan.

Harris makes an op amp with a slew rate faster than 300v/us and if anyone has access to these please let ATVQ know how the system responds. Until then happy chroma-keying.

John KD0LO

Editors note: You can substitute a black and white source for the keying signal and use this as a luminance keyer rather than a chroma keyer. The difference being that you would be using the luminance signal as the key signal rather than a selected color. Henry KB9FO



ATV NEWS

WILL YOUR HOME VIDEO WIN A NEW ICOM TRANSCEIVER OR AEA ATV TRANSCEIVER OR ANY OF THE OTHER PRIZES?

THE WESTERN WASHINGTON ATV CLUB, CHUCK NORTHCUTT W7SRZ PRESIDENT, WITH COOPERATION FROM ATVQ IS SPONSORING A HOME VIDEO CONTEST. YOUR HOME VIDEO ABOUT ANY ASPECT OF HAM RADIO COULD WIN ANY OF A NUMBER OF GREAT PRIZES. SEE PAGE 37 FOR OFFICIAL ENTRY FORM AND DETAILS.

NEW ATV RPT

LONDON, ONT., CANADA

The London, Ontario ATV group is pleased to announce the establishment of the VE3TVL ATV repeater in London, Ontario, Canada. The repeater is crossband and uses PC ATVR4 on 439.25 Mhz receive and a PC RTX23 on 1253.25 MHz for transmit. The system uses a VOR-2 for key-up and an Elatron video ID board. Power amp is a Downeast Microwave 2316PA with 18 watts to a Lindsay TZU antenna. Output is horizontal with 8.2 db gain on rx and tx. Audio link is 145.670.

VE3TVL is the first ATV repeater to use the Lindsay TZU 1255 Mhz version antenna. There are 21 users at present. Most use a PC TVC12G and Tonna 23 element yagi. Repeater owners went to the extra expense of going horizontal as all local ATV'ers are already horizontal. Crossband operation was mandated because of the smaller UHF spectrum available in Canada. Also 900 Mhz is currently not available in Canada. TNX VE-3ZK, Jim "Diz" DeZorzi

OREGON GETS ATV FREQ!

The saga of ATV in Oregon seems to have finally gotten a happy ending. Ed Millnick reports that he is now president of a newly formed ATV Association (OATVA). He reports that after a long summer battle with the local FC, Oregon ATVers have 426.25MHz as a statewide frequency for both simplex and repeater input. Repeater outputs will be in the 1.2 GHz band. He reports that now that the controversy has ended that

growth and enthusiasm are now rapidly growing.

DAVENPORT

ATVQ travels just about everywhere. Henry, KB9FO visited the Peoria Super-fest which was great as usual. A large contingent of Davenport area ATV'ers dropped by with the latest news. The Davenport ATV repeater club (BRATS) has reportedly had several changes for the better. Phil N9ZK is now president. Mike WB0QCD took his equipment and left the repeater group reportedly after several arguments with other members. The repeater lost its home at St. Ambrose University, but was saved with a better location at Channel 6 KWQC TV with a 100 foot higher antenna site by WB0EIZ John Hageman, chief engineer at channel 6. The club reports increased attendance at meetings and increased on-air activity.

Seen on the air is a new ATV signal from about 40 miles north of Davenport. It was reported that WB0QCD and another ham have started a "by invitation only" ATV repeater club. The transmitter has been seen on 434, 426.25 and 427.25 Mhz. It is reported to be an un-attended beacon which operates from a timer and battery. The video is a familiar Coco bulletin board with information about the new proposed repeater. ATVQ was unable to reach WB0QCD for comment or further info.

YORK

Bill WB8ELK and Henry KB9FO were at the York, PA hamfest and ATV symposium. Hurricane Hugo put a damper on the hamfest Saturday but the weather Sunday was perfect. The Saturday night ATV symposium was sold out. The homebrew contest drew a substantial number of entries and last minute donations by Bill and Henry provided prizes for ALL entrants! Also a drawing was held for all attenders for an Elatron video ID board donated by Bill.

Mobile ATV operations brought mobile ATV QSO's with several ATV'ers in Indiana, Ohio, Pennsylvania including a mobile to mobile contact! Best DX was 50 miles

over two mountain ranges to Mechanicsburg area ATV'ers including an exciting tunnel emergence and temporary air-borne operation! Stations worked while mobile include N8EWV, W8ANU, KD8PE, KA8-FUZ, N8KPS, WA8SVO, W8PKC, K8UHM, N8EVV, W8ANN, W3QNI, K3IBD, W3TTL, WA3USG, W3SST, to name a few!

ATCO

Central Ohio was not neglected as Henry managed a visit to the monthly ATCO picnic/show & tell in Columbus Sunday afternoon. About 60 ATV'ers and family were in attendance with 2 meter and ATV talk-in/view-in. Henry operated his ATV mobile station (100 watts and a 20 element circular polarized yagi!) which was also his show & tell entry. Over 20 entries were on display. The YL's provided a great picnic lunch for which all were thankful.

NEPTUNE

The Chicago ATV Repeater, PATC, operated for the 7 days of NASA fly-by of Neptune. The Satellite NASA select video was relayed to the repeater which operate with 6 KW ERP, omni vertical. In addition to ham reception reports area Radio Shack stores tuned TV sets to the repeater output for in-store promo of ham radio/TV and to attract customers! One local appliance/TV store had 186 TV sets at one time fed from their central antenna feed and a downconverter for the morning NASA daily summary show. This is a great way to promote ham radio as more than just disaster communications! Get on TV and get noticed! Anixter-Mark antenna Corporation also sent a reception report and an inquiry about ATV.

This prompts us to suggest that ANY ATV'er could do likewise. When doing a public service or NASA relay, contact your local TV stores and get them to display your video. Provide a sign "video provided by ham radio/TV/repeater/-----" for each store. You benefit from local exposure, your club benefits, ham radio benefits and the store benefits! A win win win situation.

MOBILE ATV

Looking for quick and easy mobile ATV? Well you don't have to have a big antenna like KB9FO, but here is a list of simple things to do to make it easy. Radio Shack makes an "industrial strength" type velcro. This stuck to the top and bottom of an ATV rig (anything under 3 pounds) lets you "stick" your rig to the dash. Now velcro a box holding your Eltronix video ID with an added PC Electronics VOR-2 for automatic video ID to the bottom of the ATV rig. Finally, the Radio Shack Portavision 22 pocket color TV can be "stuck" to the car as well. The R/S color TV tunes directly down to 420 Mhz covering all the popular ATV frequencies with NO modifications! Using the UHF tuning you can monitor your off-air signal to adjust camera, etc, and using the VHF tuning, take your downconverter output to the external antenna jack to receive ATV. We used a cheap RCA CCD color camera (the type used with a separate recorder) and more velcro to hold it to the dash for the video source. Once all the adhesive strips are in place you can mount or strip the gear from the car in about 60 seconds! Spade lugs connect all the DC cables to a power block wired with jumpers to provide multiple outputs of +12 and heavy cable to the car battery. The D100NATV (1 in 80-100 out) Mirage amp was cooled with a small R/S DC fan. The Mirage mounting "fins" were turned upside down to be over the heat sink and the fan corner holes (muffin type) mate on the diagonal. The small fan keeps the amp cool for HOURS of operation. The EIRD 43 showed 50-60 watts on black video (depending on engine speed) even with the 200 watt 2 meter rig in transmit. (Henry does not believe in QRP mobile!) A phone list of ATVers and a cellular phone helped dig some stations out of the woodwork and also to find stations not operating on "standard" midwest 2 meter frequencies of 144.34 or 147.45. It would really help to get more activity on ATV if every group made its

2 meter frequency known or moved to a common frequency or two! Especially during band openings.

NEW MAGAZINE

RADIOSCAN is a new ham radio magazine published by Luis Gimenez. The magazine is in Spanish and is a high quality production. One of the regular features is an ATV column by Armando Fernandez KA4GAQ. So far each issue has had a different topic of interest.

Other regular topics are general interest items, RTTY, DX, FAX, AMTOR and other "special modes. The overall Magazine compares to Ham Radio, CQ or QST with about 72 glossy full color pages. Anyone wanting to brush up on Spanish or who's first language is Spanish would enjoy the magazine. Contact RadioScan, 175 Fountainblue Blvd. Suite 2K-5, Miami, FL 33172.

NEWBURGH, NY

Jim WB2WLN reports that local activity in the Newburgh, NY area monitors 147.45 simplex with activity nights every Mon and Weds around 9pm. The WB2WLN ATV repeater has an input on 439.25 Mhz and outputs on 426.25 vertically polarized. There are about 6 active ATV'ers in the Newburgh-Poughkeepsie area.

ST. PETERSBURG, FL

Red WA4GRK reports that activity can be raised on ATV by calling on 144.900 Mhz. Also Red monitors 144.120 and 144.200 SSB for those rare 900 mile plus ATV contacts with Texas. ATV is usually on 439.25 and is horizontal. Active stations in the St. Pete-Tampa area are WB4BLU, WA4ZAA, KF4JU (Also on 1288 Mhz ATV), K4QXX, N4EHN, K4DAV, K4DTZ, WA4CHA and WA4WKO.

EUSTACE, TEXAS

Jay KB5CCA notes that his ATV repeater is operating with 910.25 input / 426.25 output vertically polarized. The repeater is located 65 miles SE of Dallas and west of the Tyler area. There are about 11 active ATV'ers and call themselves the East Texas Weather Watchers. They link up the WX radar from the W5KPZ Tyler ATV repeater and also can link up to the Dallas radar. Calling frequency

is 147.02 (+600) repeater and also 144.34 Mhz simplex.

NORTH CAROLINA MOUNTAIN TOP EXPEDITION

Early August of this year Don K4SAO and Edgar KC4CTW took their 50 Watt ATV station up to 6200 foot Roan Mountain on the North Carolina/Tennessee border. With the help of some early morning band enhancement many long range contacts were made with ATV'ers in Ohio between 270 to 350 miles away. Tom WA8ZAH and Mel KA8LWR worked 2-way with Don with pictures approaching P3 or better at times. Bill WB8YIF, Bill W8DMR, Dick W8RVH, John N8GWE, Bill WB8ELK and Jack WA8-JLB all made two meter contacts and observable sync bars. Don reports that he will make other expeditions with the success of this trip and will improve his antenna arrangement. Don wishes to thank Fred WD4KTI for helping him establish communications with the Ohio ATV group. Contact K4SAO Don Fortner - 166 Holston Valley Circle - Inman, SC 29349 if you'd like to arrange future mountain top ATV contacts in the area.

WA4ADG BALLOON

On Aug. 5, a balloon was flown to celebrate Man's first walk on the Moon from Oak Ridge, TN. The package called PARAKEET which stands for Packet-Equipped Aircraft-signalling Reconnaissance-performing Amateur radio Keyed Electronically for Elevated Transmissions). Carl Lyster WA4ADG built a flight computer and a digitized voice and packet message which was relayed out on 2 meters on 144.34. The 30 second voice message consisted of President Kennedy's address to start the goal of landing a man on the moon followed by a packet beacon and Neil Armstrong's famous words as he stepped on the moon. After this sequence a one minute CW telemetry message was sent out on 28.866 Mhz. Also included was an ELT transmitter to provide a tracking signal for the Civil Air Patrol. (Carl left the ELT on after the aborted first attempt and ended up with a whole contingent of the CAP on his doorstep a

couple of hours later.)

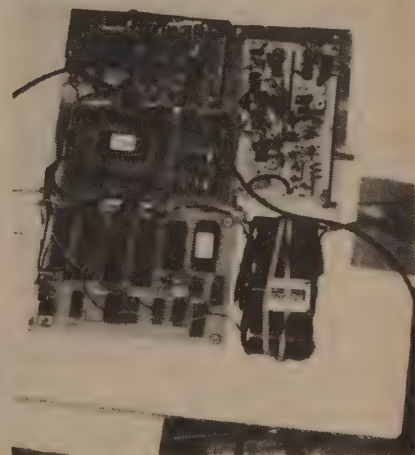
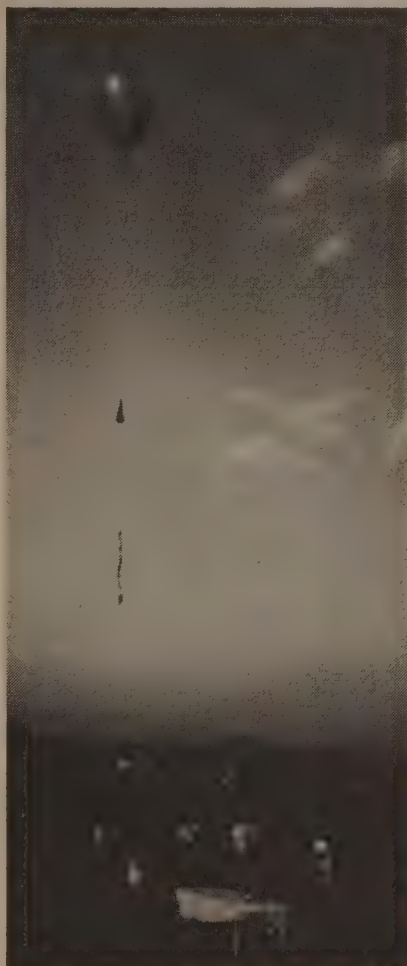
At 7:30am the balloon was launched and headed up to it's final altitude of nearly 90,000 feet. Two weeks earlier a voltage regulator failure had scrubbed the mission and resulted in the loss of the helium in the balloon. Since the balloon had been inflated once before, it developed a bulge when it was filled...it seemed to work just fine but certainly looked strange!

At maximum altitude the signal was heard as far away as 428 miles at which point the balloon burst and the payload headed back to earth. The Civil Air Patrol (CAP) was tracking the balloon throughout it's flight and provided continuous latitude and longitude readings. The CAP actually caught up with the package as it descended through 10,000 feet and flew along with it watching it land in the top of a very large tree on the southwest edge of Knoxville. It took several hours to attempt to retrieve the package. Finally the power company was called and a cherry picker truck was used to lift a man with a 20 foot pole to snag the package. Dave N4HBO had attached a Kodak Disk Camera to the side of the package with a timer circuit to take a picture every 5 minutes. However, only a few of the pictures had much recognizable detail possibly due to moisture or frost on the lens. Send your reception reports for a special QSL to Carl Lyster - 4412 DAMAS RD. Knoxville, TN 37921.

SUBSCRIPTIONS AND THE MAIL

We have had a number of copies lost in the mail. ATVQ has used a professional mass mailing service in Topeka, KS as well as the extra expense of plastic bags in an effort to get undamaged copies to each and every reader. This issue is being mailed about Oct. 25 and as an experiment will be mailed from Des Plaines, IL using a local mass mailer service. We would like feedback if anyone gets their issue more than three weeks late. We have sent a letter of complaint to the Post Office in Topeka each time we hear of an undelivered copy but it doesn't

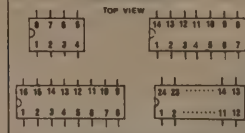
seem be doing much good, thus the change. This issue will be staple closed not bagged and a different label type used. Also if you have your ZIP + 4 number, please show it on your renewals. Thanks.



FM Broadcasting: CH#201 = 88.1 MHz—every 0.2 MHz—Ch#300 = 107.9 MHz

Thermal noise ($T = 20^\circ\text{C}$, $B = 15\text{ kHz}$) = -132 dBm

I C PINOUT



Transmission & Propagation

$$\lambda_R = \frac{983.6 \times (\text{velocity factor})}{\text{fMHz}}$$

$$\lambda_m = \frac{299.8 \times (\text{velocity factor})}{\text{fMHz}}$$

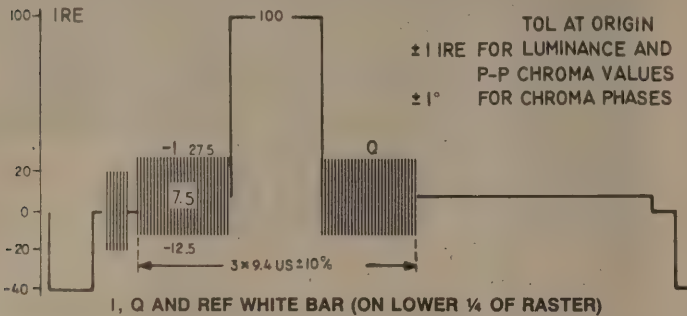
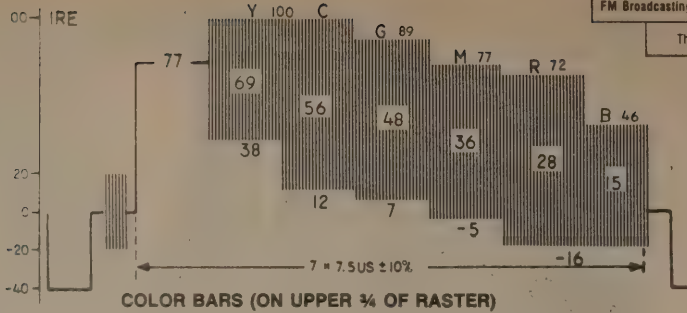
Material	vel. fact.
vacuum	1
solid poly	0.66
foam	0.78-0.82

TV CHANNELS

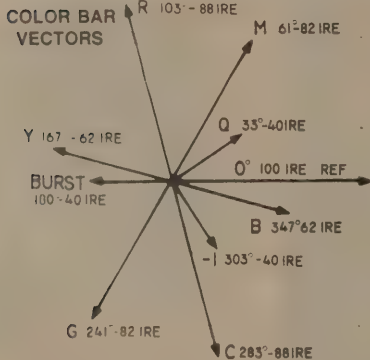
Limits = 8MHz

Picture carrier = +1.25MHz Sound carrier = +5.75MHz

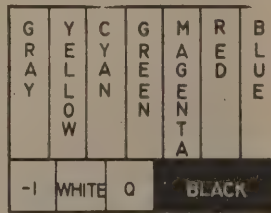
Channel MHz	Channel MHz
2 54	43 644
3 60	44 650
4 66	45 656
5 72	46 662
6 78	47 668
7 84	48 674
8 90	49 680
9 96	50 686
10 102	51 692
11 108	52 698
12 114	53 704
13 120	54 710
14 126	55 716
15 132	56 722
16 138	57 728
17 144	58 734
18 150	59 740
19 156	60 746
20 162	61 752
21 168	62 758
22 174	63 764
23 180	64 770
24 186	65 776
25 192	66 782
26 198	67 788
27 204	68 794
28 210	69 800
29 216	70 806
30 222	71 812
31 228	72 818
32 234	73 824
33 240	74 830
34 246	75 836
35 252	76 842
36 258	77 848
37 264	78 854
38 270	79 860
39 276	80 866
40 282	81 872
41 288	82 878
42 294	83 884



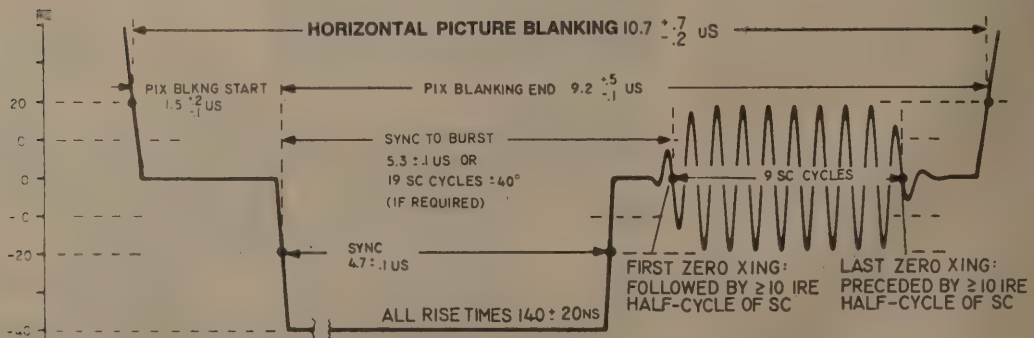
TOL AT ORIGIN
 $\pm 1\text{ IRE}$ FOR LUMINANCE AND
P-P CHROMA VALUES
 $\pm 1^\circ$ FOR CHROMA PHASES



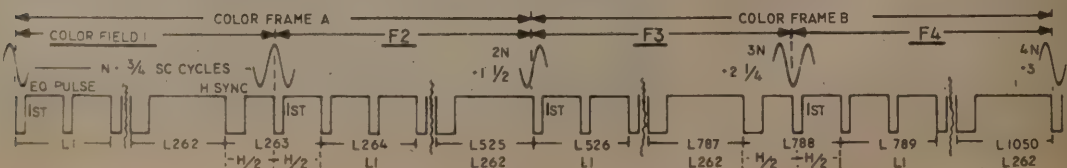
100% SATURATED COLOR BARS
OF 75% AMPL WITH 7.5% SETUP



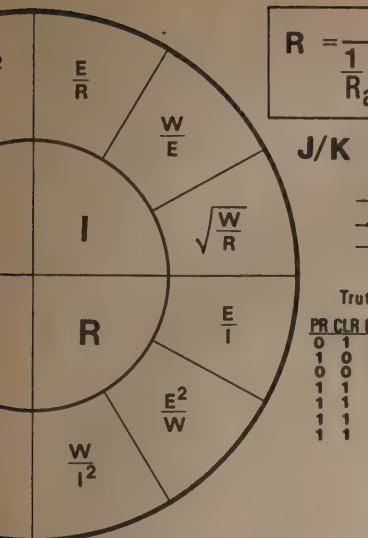
ABC, Hans Schmid



VERTICAL PICTURE BLANKING 20 H-LINES $\pm 1\text{H}$ (FROM 1st EQUALIZING PULSE)



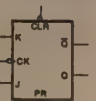
ABC, Hans Schmid



$$R = \frac{1}{\frac{1}{R_a} + \frac{1}{R_b} + \frac{1}{R_c} + \frac{1}{R_n}}$$
$$R = \frac{R_a \times R_b}{R_a + R_b}$$

Resistors in Parallel

J/K FLIPFLOP



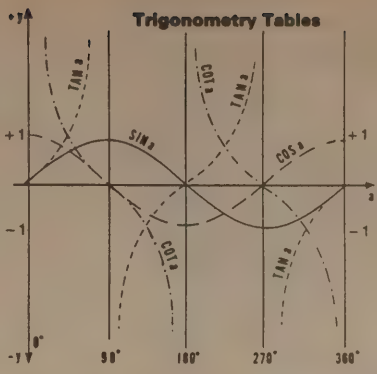
Truth Table

J	K	Q	Q'
0	0	1	0
0	1	0	1
1	0	1	0
1	1	0	1

1 in = 2.54 cm = 25.4 mm
1 ft = 30.48 cm = 0.3048 m
1 m = 3.28 ft = 39.37 in
1 mi = 5280 ft = 1.609 km
1 km = 0.621 mi
* exact value

$$VSWR = \frac{1 + \sqrt{\frac{P_{ref}}{P_{twd}}}}{1 - \sqrt{\frac{P_{ref}}{P_{twd}}}}$$

VSWR



NAND



Truth Table

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

NOR



Truth Table

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

Column	0	1	2	3	4	5	6	7
Row	0	NUL	DLE	SP	0	A	P	w
1	SON	DC1	:	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	'	3	C	S	c	s
4	ROT	DC4	\$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	LF	EM	)	9	I	Y	i	y
10	FF	SS	*	10	J	Z	j	z
11	VT	ESC	+	11	K	[	k	(
12	FF	FS	<	12	L	~	l	~
13	CR	OS	-	13	M	]	m]
14	SO	RS	>	14	N	^	n	^
15	SI	US	/	15	O	_	o	_

STANDARD CODE FOR INFORMATION INTERCHANGE (ASCII)

CONVERSION CHART

Binary	BCD	Dec	Oct	Hex	Binary	BCD
00000001	0000 0001	61	63	33	00110011	0101 0001
00000010	0000 0010	62	64	34	00110100	0101 0010
00000011	0000 0011	63	65	35	00110101	0101 0011
00000100	0000 0100	64	66	36	00110110	0101 0100
00000101	0000 0101	65	67	37	00110111	0101 0101
00000110	0000 0110	66	70	38	00111000	0101 0110
00000111	0000 0111	67	71	39	00111001	0101 0111
00001000	0000 1000	68	72	3A	00111010	0101 1000
00001001	0000 1001	69	73	3B	00111011	0101 1001
00001010	0001 0000	70	74	3C	00111100	0101 0000
00001011	0001 0001	71	75	3D	00111101	0101 0001
00001100	0001 0010	72	76	E	00111110	0101 0010
00001101	0001 0011	73	77	3F	00111111	0101 0011
00001110	0001 0100	74	100	40	01000000	0110 0100
00001111	0001 0101	75	101	41	01000001	0110 0101
00010000	0001 0110	76	102	42	01000010	0110 0110
00010001	0001 0111	77	103	43	01000011	0110 0111
00010010	0001 1000	78	104	44	01000100	0110 1000
00010011	0001 1001	79	105	45	01000101	0110 1001
00010100	0001 1010	80	106	46	01000110	0111 0000
00010101	0001 1011	81	107	47	01000111	0111 0001
00010110	0001 1100	82	110	48	01001000	0111 0010
00010111	0001 1101	83	111	49	01001001	0111 0011
00011000	0001 1110	84	112	4A	01001010	0111 0100
00011001	0001 1111	85	113	4B	01001011	0111 0101
00011010	0010 0000	86	114	4C	01001100	0111 0110
00011011	0010 0001	87	115	4D	01001101	0111 0111
00011100	0010 0010	88	116	4E	01001110	0111 1000
00011101	0010 0011	89	117	4F	01001111	0111 1001
00011110	0010 0100	90	120	50	01010000	0100 0000
00011111	0010 0101	91	121	51	01010001	0100 0001
00100000	0010 0110	92	122	52	01010010	0100 0010
00100001	0010 0111	93	123	53	01010011	0100 0011
00100010	0010 1000	94	124	54	01010100	0100 0100
00100011	0010 1001	95	125	55	01010101	0100 0101
00100100	0010 1010	96	126	56	01010110	0100 0110
00100101	0010 1011	97	127	57	01010111	0100 0111
00100110	0010 1100	98	130	58	01011000	0100 1000
00100111	0010 1101	99	131	59	01011001	0100 1001
00101000	0100 0000	100	132	5A	01011010	0100 1010
00101001	0100 0001	101	133	5B	01011011	0100 1011
00101010	0100 0010	102	134	5C	01011100	0100 1100
00101011	0100 0011	103	135	5D	01011101	0100 1101
00101100	0100 0100	104	136	5E	01011110	0100 1110
00101101	0100 0101	105	137	5F	01011111	0100 1111
00101110	0100 0110	106	140	60	01100000	0101 0000
00101111	0100 0111	107	141	61	01100001	0101 0001
00110000	0100 1000	108	142	62	01100010	0101 0010
00110001	0100 1001	109	143	63	01100011	0101 0011
00110010	0101 0000	110	144	64	01100100	0101 0100

Powers of Two	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
	1	2	4	8	16	32	64	128	256	512	1,024	2,048	4,096	8,192	16,384	32,768	65,536	131,072	262,144	524,288	1,048,576	2,097,152	4,194,304	8,388,608	16,777,216	33,554,432	67,108,864	134,217,728	268,435,456	536,870,912	1,073,741,824	2,147,483,648	4,294,967,296	8,589,934,592	17,179,869,184	34,359,738,368	68,719,476,736	137,438,953,472	274,877,906,944	549,755,813,888	1,099,511,627,776	2,199,023,255,552	4,398,046,511,104	8,796,093,022,208	17,592,186,044,416	35,184,372,088,832	70,368,744,177,664	140,737,488,355,328	281,474,976,710,656	562,949,953,421,312	1,125,899,906,842,624

LOAD

VU METER RANGE EXTENDING PAD

OUTPUT LEVEL: VU 600Ω, R-1 OHMS, R-2 OHMS, R-3 OHMS

+4	3600	0	OMIT
+6	4047	447	16,790
+8	4482	883	8,180
+10	4896	1296	5,220
+12	5279	1679	3,690
+14	5655	2025	2,741
+16	5934	2334	2,091
+18	6803	2603	1,621
+20	6544	2833	1,268

For a 150Ω line, add 6VU to the output level figure

Proof of Performance frequencies (Hz)

50	100	400	1000	5000	10000	15000
----	-----	-----	------	------	-------	-------

1 kWh = 3413 BTU
1 hp = 746 W
1 ton(AC) = 12,000 BTU/hr

Screw Size

4-40	6-32	8-32	10-32	12-24
------	------	------	-------	-------

Clear drill

1/8	9/64	11/64	3/16	1/4
-----	------	-------	------	-----

Diode Polarity

1 pf = 1 mmf 1 nf = .001 ml

Calibration (Bessel null) freq's (Hz)

# nulls	5kHz	25 kHz	75 kHz
1	2079	10396	31187
2	906	4529	13587
3	578	2889	8667

(SCA) (TV) (FM)

HENRY 2004 ON ATV

by HENRY RUTH KB9FO

The search for high power for ATV has for years been a problem. Narrow band modes such as SSB and FM are very easy to amplify to respectable power levels. Numerous articles in QST and other magazines featuring the use of 4CX250 type circuits or 8874 tubes abound. The most famous of which is the K2RIW amp which uses 2, 4CX250's in parallel. With a good power supply these will easily supply 400 watts and up of RF for FM, SSB (up to a KW if you push it) and make your Bird 43 peg in happiness. But introduce a wide ATV signal and the power is typically 100 watts (average) and the bandwidth is so restricted that its difficult to impossible to get good color or subcarrier sound through. If you lightly couple to get bandwidth, the power drops even more. Twenty DB of reduction at 4.5 Mhz is not uncommon in these designs.

For those lucky enough to have the bux, there is an answer. The Henry 2004, at \$1595 (with coax relay) plus shipping is a hefty "toy" for the shack. But the Henry amp does work well, after a few mods.

Mine arrived last year and has been in use for about 8 months. The unit easily put out over 1 KW in FM and SSB using a 3CX800 tube. When I tried video, the average was a dismal 200 watts (600 peak of sync). I tried every adjustment and even tried massive input power (80-100 watts) only to wipe out the tube with excessive grid power. The

3CX800 has a gold plated grid. If you overdrive the amp, even for a short time, the gold will evaporate and deposit on the cathode and kill the cathode emission. A \$400 mistake. Others with the amp have had the same problem (also losing a few tubes in the process of discovery) and also noted the inability to really "peak" the tuning at 439.25.

The plate load control is inside the main chassis and is a screw on the top of the RF deck. This pushes a "flapper" button closer or farther from the plate line. The tuning is from the front and there is a front panel grid tune knob.

Although 600 watts peak of sync is OK, it seemed a little high on a dollar per watt cost basis at nearly \$3/watt. Tests were also run using my 430-450 FM/SSB equipment and it showed that the response was narrow, typically -1 db at .5 Mhz. Bruce Brown WB4YTU sent me a multi-burst generator and I ran a number of tests on my station which was a PC TC-70, Alinco 20 watt amp, Mirage D1010NR-ATV and the Henry 2004 feeding both a KW rated commercial dummy and the 4 88 element J-Beams at 60 feet. Response was down about 3 db at 2.5 Mhz and 6 db at 4.5 Mhz and 14 db at 5 Mhz from carrier. This was with the rear panel mounted band-pass filter removed. With the filter in the passband was about 1.5 Mhz at 3 db and 10 db at 3 Mhz.

So step one was to remove the bandpass filter. The amp still did not "tune" well. Well, set

the project away for another day. Then in a QSO with Jeff KA9TGX in Lafayette who uses the same RF deck. He had also noted the same problem. The band was HOT, P5 noise free pix over the 130 mile path in full color with the preamps OFF! So the grand experiment. Band conditions were stable so I took Jeff's suggestion and tried his "cure." Removing the top of the RF deck (practice from tube replacement) gains access to the plate load "flapper" cap. This is just a metal plate bent at about 45 degrees from its soldered mounting point on the RF connector. The screw moves this up and down, but it follows an arc, pivoting at the bend which is near the RF connector. By adding a bend a little farther out and removing most of the original bend, you can make this flapper move more perpendicular to the plate line reducing the coupling. Use care as there are screws and the box to which the link plate could arc if you go too far. The idea is to get about the same distance as originally made but the flapper button is now parallel rather than tilted to the plate line. Put it back together and Eureka!

Now the screw adjustment has a definite peak in its adjustment. Power output went up 100 watts (both peak and average). Jeff reported much stronger color and the unit seemed to tune much better.

Now the tests. With the amp tuned to 439.25 using the FM rig, I switch to the ATV rig (start with

FM so there are no sidebands from video, subcarrier etc) and took some power measurements. Best picture reports were at 400 watts average (up from 200) and color was much stronger and present on both sides. Back to the FM rig. The known power roll-off of the D1010 and Kenwood are known to me so the amount of drive variance was able to be taken into account. Going from 440 to 436 Mhz produced the following results:

440:00	670 watts
439.75	650
439.25	600
439.00	600
438.50	650
438.00	550
437.50	450
436.00	400
436.00	300

Switching to my other radio which has different RF output, the power was:

440.00	1000 watts
441.00	980
442.00	900
443.75	850
444.00	825
445.00	750
446.00	400
447.00	100

Different tuning of the plate load/tune will vary the results you get because as you reduce the loading the bandwidth will increase but absolute power should decrease. I was able to get even flatter response by setting the output load so that the maximum power out was at 600 watts (carrier only) but not much more improvement at 500 watts. Grid current is very sensitive to tuning of the plate and you need to watch it carefully. A slightly negative current

is OK and both Jeff's amp and mine have this under some conditions of video and plate tuning. I finally left mine at 0 grid current.

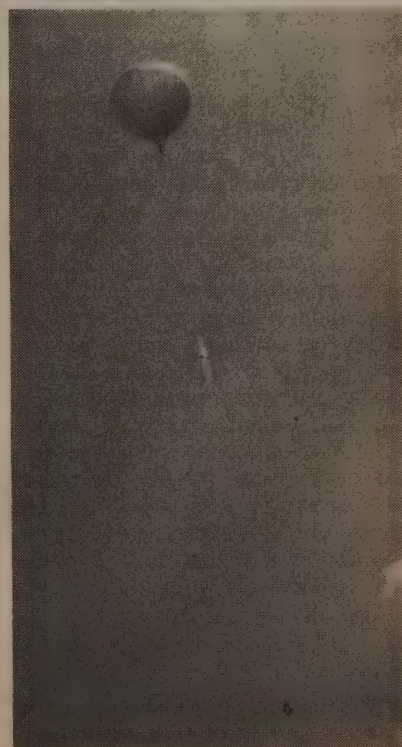
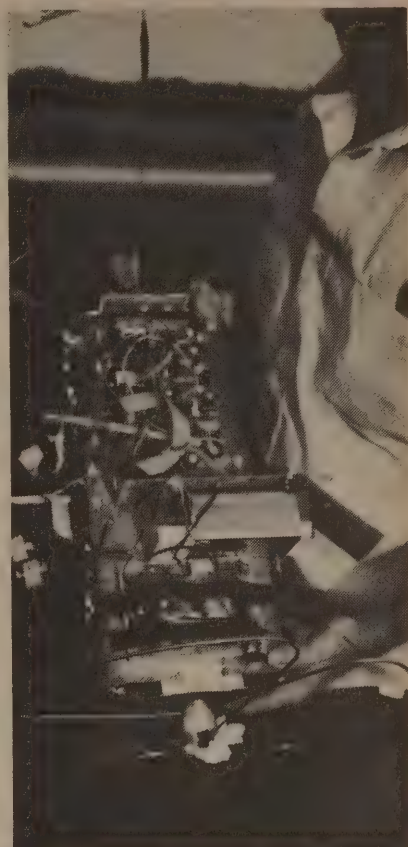
If you have too much grid power (current) the amp will not be stable and goes into thermal runaway. This is seen as a creeping increase in grid/plate current which eventually peaks out when your grid melts! On my unit, a maximum of 100 on the grid meter (full scale is 400) is about maximum I can operate and be stable. Using the TC-70 to the D1010 produces about 50-65 watts peak of sync as drive. If I drive the D1010 to full output (130 watts) the 3CX800 will over heat in less than 10 seconds.

The only other problem with the amp is that it runs HOT. My next project is to add a fan to the back to force air past the power supply resistors which throw off a lot of heat. I was also concerned with the small fan on the tube, but it works! I would have designed it with more CFM to get a cooler operating tube. There is some thermal drift on long key-down (say after 5 minutes) which requires a minor re-tune. Typically this is about 50 watts in power change. The D1010 is even worse, so if you like long key-down ATV (typically a half hour) get the repeater version of the D1010 for the better heat sink.

Also, both of my D1010's were modified for low drive power by removing the input pad which was described in ATVQ vol 2 # 1 by Tom W6ORG.

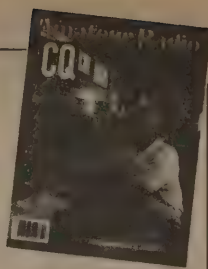
All in all, not a bad amp for ATV! 73 KB9FO

Balloon Prior To Lunch — Story Next, Page 32





The Radio Amateur's Journal



ON THE COVER: With his retirement from the U.S. Senate, Barry Goldwater, K7UGA, finds more time available for his life-long hobby of Amateur Radio from his home QTH in Scottsdale, Arizona.

FEBRUARY 1989

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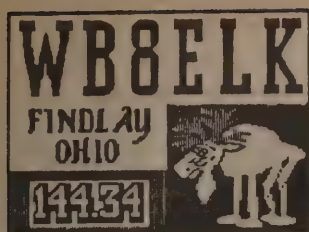
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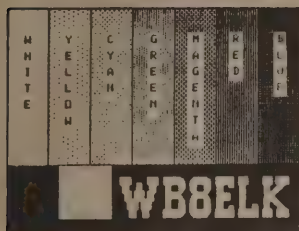
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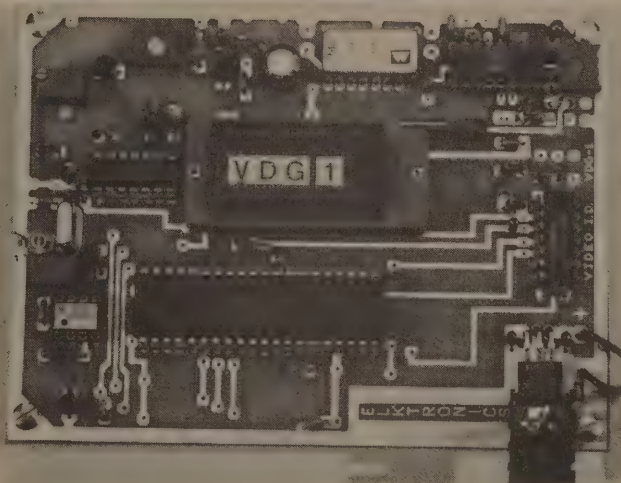
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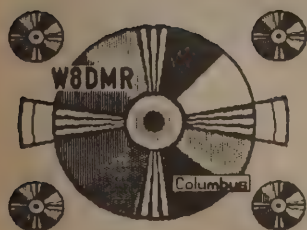
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Marion Ohio

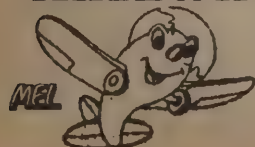


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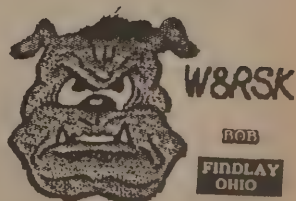
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KA8WLV
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HAS GONE BEFORE



JULY 23RD BALLOON FLIGHT

"ONE SMALL STEP FOR MAN . . . ONE GIANT LEAP FOR A BALLOON!"

In commemoration of the 20th anniversary of the first lunar landing an ATV balloon was launched from the Neil Armstrong Air and Space Museum in Wapakoneta, Ohio, Neil's hometown. Thanks to the efforts of John Zwez, the museum manager, we were able to coordinate the flight as part of the ongoing weekend activities. An ATV receiver was set up as part of the special event ham station inside the museum to allow the public to watch the balloon head to the edge of space.

This was the most intricate of the ATV payloads to date. The package carried a 2 meter FM transmitter (a whopping 42 milliwatts!) which sent out a CW message and an ATV system which consisted of a small SONY HVM-302 B/W camera pointing out the side of the package with a mirror pointing down towards the earth below. In addition to the live camera two computer ID screens depicting the space museum and the lunar landing were displayed by an Elktronics video ID every few minutes. Through the efforts of Bob Rau N8IYD the flight computer he uses for his model rocket payloads was modified to display two lines of telemetry superimposed directly over the live camera video. This system displayed our callsigns and the mission elapsed clock on the first line of telemetry and altitude, outside temp, internal temp and battery voltage on the second line. The 1 watt ATV transmitter was a P.C. Electronics KPA5 (Kreepie-Peepie) and the antenna was a Big Wheel constructed by Norm WV7K. This was all housed in a 1.5 inch thick styrofoam package painted black to help keep things warm.

The balloon was launched on July 23rd at 1:42pm from the museum parking lot just before the R/C airplane show and flew directly over the more than 400 spectators present. Spectacular views of the museum and the town of Wapakoneta could be seen as the balloon ascended at 1000 feet/minute. A few puffy clouds were

seen passing by at 5500 feet and could be seen getting smaller and smaller as the balloon left the clouds far below. The flight computer display provided us with the most detailed telemetry of any flight thus far and dramatically demonstrated that even though it was over 100 degrees on the ground it is below -71 degrees at 50,000 feet! Apparently our insulation was working as it never got below 73 degrees inside. The big wheel antenna provided us with a very omni-directional horizontal pattern as there were no sharp fades in the ATV signal throughout the flight. After nearly two hours the balloon had reached an indicated altitude of 133,900 feet. At this point the ATV signal was received as far west as Iowa (KAQJAW -380 miles) and Missouri (KD0LO & WB0ZJP - 360 miles) and as far east as Mechanicsburg, PA (WA3USG - 400 miles). Rick WA3USG was net control on 7.155 Mhz and logged reception reports from 16 states and Canada. Suddenly the balloon burst and the payload started its wild return to earth on its parachute. Dropping over 7000 feet/minute in the near vacuum the package started spinning wildly. Tom WA8ZAH made the comment "Looks like they pulled the plug and it's going down the Drain!". As denser air was encountered the package slowed its descent to about 1000 feet/minute. At 36,000 feet the flight computer's reset switch decided to short out and killed the telemetry. Shortly after that the package went through a large cloud and fogged up the mirror. Only blurred images of farmhouses could be seen just before impact.

Now the fun began! Several chase vehicles with direction finding equipment had been tracking the balloon throughout the flight wandering the Ohio countryside. Randy WA8GAU and Jon WM8W were only two miles away when it landed. Randy has a phased array on the roof of his car with a mast pole he can turn from the drivers seat. Jon WM8W

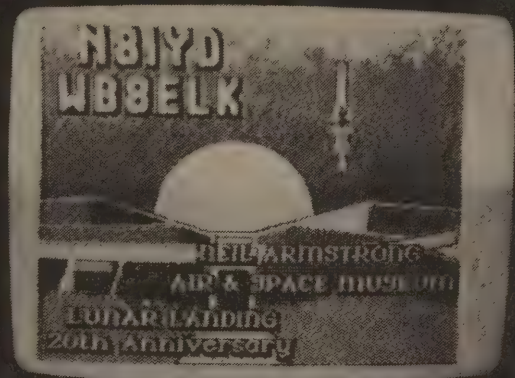
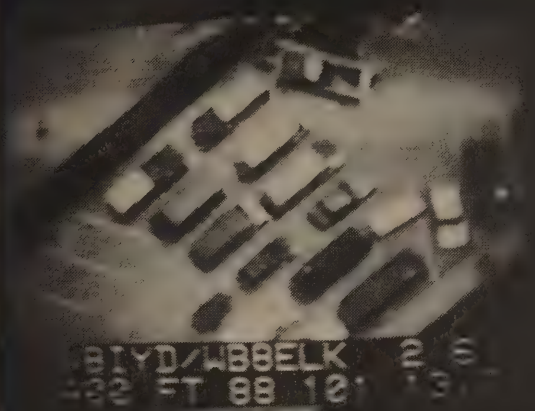
was in the back seat plotting the coordinates on the mapping table and holding a four element two meter beam out the window. The 42 mW signal disappeared on the phased array but a weak signal was heard on the beam. Shortly the cornfield was located and a search was made with a loop antenna crashing through the rows of tall corn. Randy and Jon wandered in circles for nearly 30 minutes chasing reflections in the jungle of corn sometimes coming within 100 feet of the package. These two weren't a pretty sight after being slashed by the sharp corn leaves and covered by a layer of corn pollen! To top it all off Jon discovered he was very allergic to the pollen! Meanwhile, Larry WB9YAJ and Bernie KB9AWS made their approach from down the road and wandered for awhile in a woods battling off the giant killer mosquitos. After nearly being eaten alive he emerged into a soy bean field and found the package lying just three feet inside the adjacent cornfield (Larry has become an ace balloon tracker and now has two finds to his credit!). Mel KA8LWR, Jeff KA8WLV, Joe WB8MSJ, Mark KA9SZX and myself started in from the east and attempted to cross a river (many a wet tennis shoe here!)...just as we got across we saw movement on our TV screens and saw Larry's shoe and then a smiling face staring into the balloon camera..We knew the package was safe.

The balloon had travelled 21 miles to the northwest and landed 8 miles southwest of Delphos, Ohio. My computer prediction based on radiosonde wind data had indicated 21.9 miles to the northwest missing by less than a mile. Next time I'll trust my computer and stand there with a net! 73's Bill - WB8ELK

CORRECTION

ATV'er with Henry on cover of July issue was BRIAN G8GQS, at BATC FEST.

JULY 23RD BALLOON FLIGHT
"ONE SMALL STEP FOR MAN . . . ONE GIANT LEAP FOR A BALLOON!"



ON THE ROAD (The NORTHEAST)

August found the roving ELK-MOBILE heading towards the north-east in search of more mobile ATV contacts. Art W8YOS helped us start out our adventure with an enjoyable two-way TV contact as we drove by his home in Mentor, Ohio (Cleveland area). Art showed us the advantages of living near the shore of Lake Erie with a demonstration of a lake effect band opening. As long as we stayed near the lake we were able to see a P3 picture from him as far as the toll-gate on the New York Thruway over 120 miles away!

SPRINGFIELD, MA

Numerous 2 way QSO's were made on ATV as we drove down the Mass Pike towards Boston. In the Springfield, MA and northern CT region there are many active ATV'ers. Contacts were made with Bob WBLHAB, and Chet W1HGJ in the Springfield area, John W1LIAO and Russ K1LRB in Hartland, CT, and W1LUQC and K1LYF near Hartford. The W1NI ATV repeater is located 600' above terrain on the channel 61 tower and should provide great coverage over northern CT and southern MA. Input is 434 Mhz and outputs on 421.25 Mhz horizontally polarized. Talk frequency is 144.34 Mhz simplex in the area and usually is a net night on Thursdays at 8pm. Some of the active stations in the area are AC1T, N1ALW, K1LTBS, N1FQF, W1FVO, W1NYP, N1AGV, W1HFF, W1ARKS, W1RJA, W1AFCK, N1GAU and K1LRP.

BOSTON, MA

Give a call on the 145.29 repeater when in the northern part of Boston. This will usually net you one of the active ATV'ers. Contacts were made with Gene W1VRK, Red K1CKS, and Mel W1BHD among others as we drove along the 495 towards Maine. The K1AFE ATV repeater is located near North Andover on top of Boston Hill about 18 miles north of Boston and has an input on 434 Mhz as well as 911.25 Mhz and outputs on 421.25 Mhz vertically.

MAINE

I vacation each year on Monhegan Island, ME. It's an island ten miles out to sea and has a clear shot back towards Boston and NH. If you'd like to set up an ATV schedule next August contact me. We attempted contacts with the Boston group but no band enhancements were present at the time. I did run across one potential ATV'er in the Bangor area. Mark K1CVCV would like to get some info on any activity in that area.

ALBANY, NY

I paid a visit with Jud K2CBA in Grafton, NY east of Albany. Jud has a impressive array of dish antennas scattered all over his place. He has a 10 foot dish for ATV mounted on top of his Rotatable tower. He has a prop pitch motor at the base of the tower which turns the whole works dish and all. In the back yard he has a 28 foot dish he's going to mount on a dump truck drive shaft to

rotate. Also he has a 60 foot dish he is ready to assemble when he comes up with a way to mount it! Jud lives up on high ground and may be able to make some good DX contacts on ATV. In the Albany area there is a net on Thursday nights at 9pm on the calling frequency of 146.49 Mhz. A contact was made with Bill W2MTE in the Albany-Schenectady area. Bill has been active in covering public events such as road races with ATV and has involved a-number of the locals ATV'ers in this activity. Another place to find the locals is on the 146.835 (-600) repeater which is on Jud's QTH.

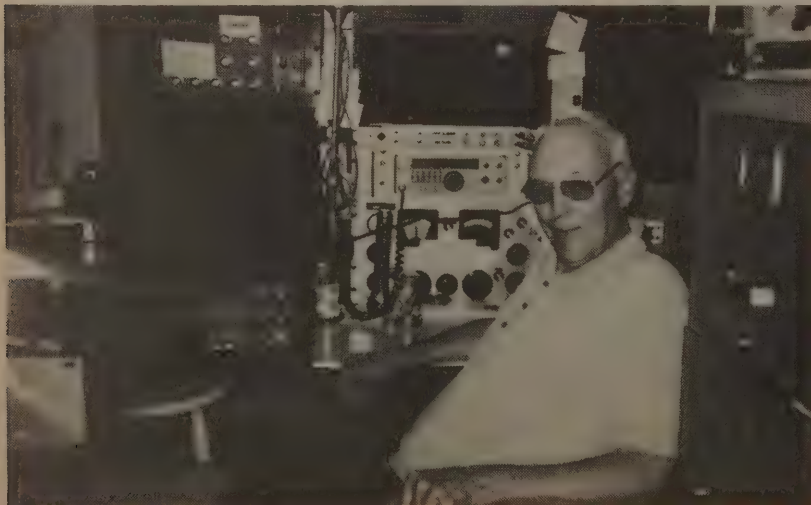
BUFFALO, NY

Just about anytime during the day or evening a call on 144.34 will net you one of the members of this very active group. I was able to work Ralph W2RPO, Mac W2UBR and Casey W2OSW as I came through. I've worked Ralph and Casey in Ohio on several occasions even though they are 300 miles away from my home QTH.

ERIE, PA

I was able to work Ed W3POS from Erie, PA almost 60 miles away clear into Ohio on my return. Ed has been responsible for many long range contacts including a 578 mile contact with K0-IWA in Iowa during the Thanksgiving 86 opening.

The roving ELK will be taking a journey into the heartland of the US in the next few months.



← MAC, W2UBR, Buffalo

JUD, K2CBA →

Sir:

I am a member of Western Vision Network here in Colo. I am looking for PC Boards for 23CM down converter. I read the article in the Feb. issue are there others. I would like to make it as a club project.

73
Jim



ATV IN THE NEWS

Most who have heard my "speech" at ATV gatherings know that I am very involved in promoting ham radio with the use of HAM TV. This is based upon a simple premise: If commercial television is the most powerful advertising medium, shouldn't ham TV be the best way to demonstrate and market ham radio? There is NO mode which cannot be shown on HAM TV. Try showing TV on CW or SSB! The public is already become video savvy. The emergence of computers, video games, video effects in movies and science fiction, home video cameras, VTR's and the burgeoning home video market all aid in making the public aware of video. Ham TV should be at the forefront of any effort to attract this ready made audience which is now video acceptable. The public is now embracing video as never before, what better time to use ham TV to market the other and all aspects of ham radio as a hobby, service, and fun activity! Others have been equally active locally as ATVQ's national efforts.

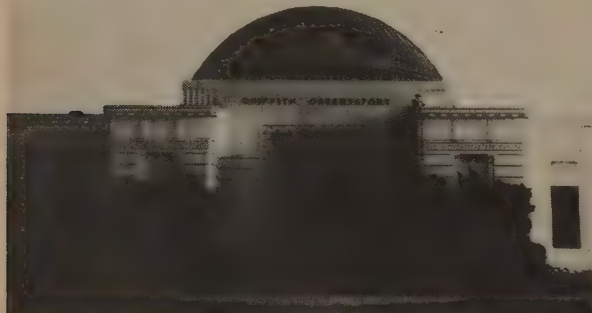
Angelo Polvere KA9CSO, Chicago area ATV'er was able to get the prestigious Chicago Tribune to devote the front page and portion of a second page of its TEMPO section to ham radio. The article by Clarence Peterson covers all aspects of ham radio as well as ATV. A live ATV QSO between Angelo and N9AB, Andy, also of the Chicago area was a feature item of the article. A good portion of the article discusses public service and how even handicapped persons can become hams. Hats off!

WESTERN WASHINGTON ATS

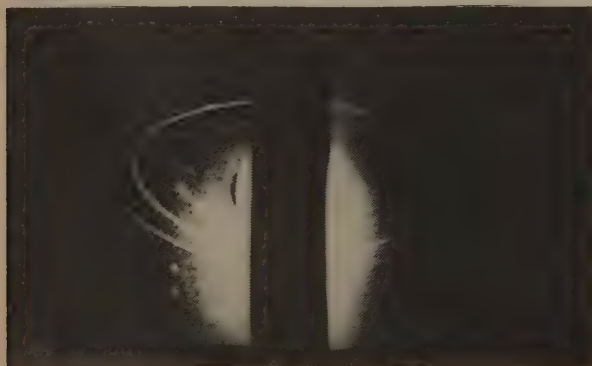
Another active group (Read our big surprise later this issue) is the WWATS based in the Seattle area. Bob KC7QR is featured in a FRONT PAGE article in the Everett, WA HERALD. Bob went ATV mountain topping with his ATV gear with reporter in tow. The portable set-up including a small AC generator provided 30 watts of video RF at good altitude to provide 100 mile + ATV. The article describes the ATV QSO activity which was both live and video tapes, some shot

moments before, with two way exchanges with several area ATVers in WA and BC. The article continues with the public service functions and several ideas for future ATV uses. All in all a great story to gain publicity for ATV and HAM RADIO—using ATV!

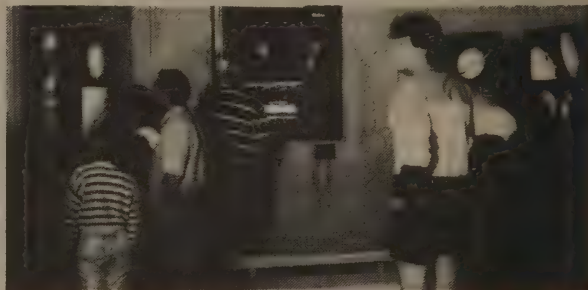
Ernie Williams WB6BAP and friends set up a link from the JPL via a portable repeater in Pasadena to the Griffith Observatory located in the Hollywood hills above LA. The link relayed the NASA Neptune video. John Mosley, head of public education at the Observatory served as moderator to the public at the Observatory. John also writes the scripts for regular planetarium presentations. Phil Smith WB6LQP set up the originating equipment at the JPL. Phil organizes the Rose Parade PSA ATV effort. The link from the JPL was on 10 Ghz to a repeater 4.5 miles away at Mutual Savings of Pasadena. 23 cm was used to relay from the bank roof to the observatory. A second output on 426 Mhz feed Santiago Peak ATV repeater 50 miles away.



Griffith Observatory Planetarium entrance. Notice F9FT and 1200 Down Converter. 1200 Rec. is XTAL controlled P.C. Elect. 200 feet 75r COAX into P.C. UR645 I.F. worked GREAT!



Typical picture seen.



Picture received at Griffith Observatory was seen and enjoyed by the 2 million a year visitors. Here, the picture is displayed by a rear video projection system. The video also was projected onto the planetarium dome with John Mosley explaining the various pictures.



Video transmitted from JPL on 10.28 GHz FM, was received 4.5 miles away here and retransmitted on 1289 MHz AM and 426 MHz AM so that the Voyager II - Neptune encounter could be seen all over southern California.

WESTERN WASHINGTON AMATEUR TELEVISION SOCIETY AND AMATEUR TELEVISION QUARTERLY

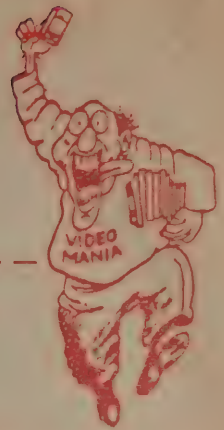
AMATEUR TELEVISION VIDEO TAPE CONTEST

----- first prize: ICOM IC 1275 1.2 Ghz TRANSCEIVER* -----

----- second prize: AEA FS430 ATV TRANSCEIVER -----

third prize: PC Electronics RX converter of your choice

additional prizes to be announced



Have we gotten your interest? Are we motivating you? GOOD!

All you have to do is make a VIDEO about ham radio using your home VHS/Beta or 8mm video equipment!

RULES OF THE CONTEST

All licensed amateur radio operators are eligible to win except members and families of the Western Washington Amateur Television Society (WWATS), Amateur Television Quarterly Magazine (ATVQ), or publishers or staff of any other ham radio magazine. That leaves about a half million US hams and any other ham in the world!

Your video tape should be about ham radio (any aspect) and have been made since May 1988. The tape must not exceed 15 minutes in length. You cannot use professional video equipment (3/4", 1") in your production chain, only consumer grade equipment: ie S-VHS, VHS, Beta, 8mm, Super Beta, etc.

Only one entry per licensed amateur please. Video must be amateur radio related and can be a documentary, educational, technical or entertainment.

Entries will be judged on the basis of creativity, technical merit and effective use of the video medium. Contestants must be original producers. Violation of copyright laws is prohibited and disqualifying.

Winners will be selected by the WWATS appointed judges. Their decision is FINAL. No substitution of prizes or exchange for cash value allowed. Any state, local or federal tax applicable is the responsibility of the recipient. Offer void where prohibited by law. Winners may be required to attest to compliance with rules of the contest.

Winners will be announced at 1990 Dayton Hamvention. Winner need not be present! All entries become the property of WWATS and ATVQ for the promotional use of ham radio and editorial and promotional uses.

Entries must be post marked no later than March 1, 1990. Postage due mail will not be accepted. Sponsors and prize donors assume no responsibility for lost or damaged entries. Return postage must accompany any videocassette to be returned, otherwise entries become the property of WWATS. WWATS is responsible for delivery of prizes to winners.

OFFICIAL ENTRY FORM

CALL: _____ NAME: _____

ADDRESS: _____

CITY: _____ STATE: _____ COUNTRY: _____ ZIP: _____

Certification: I hereby enter the WWATS/ATVQ contest and agree to abide by the rules as stated above and accept the decision of the judges. My entry is enclosed. I declare that I am the producer of this video and release all rights of copyright to WWATS and ATVQ in exchange for consideration for the prizes listed above.

DATE: _____ Signature: _____

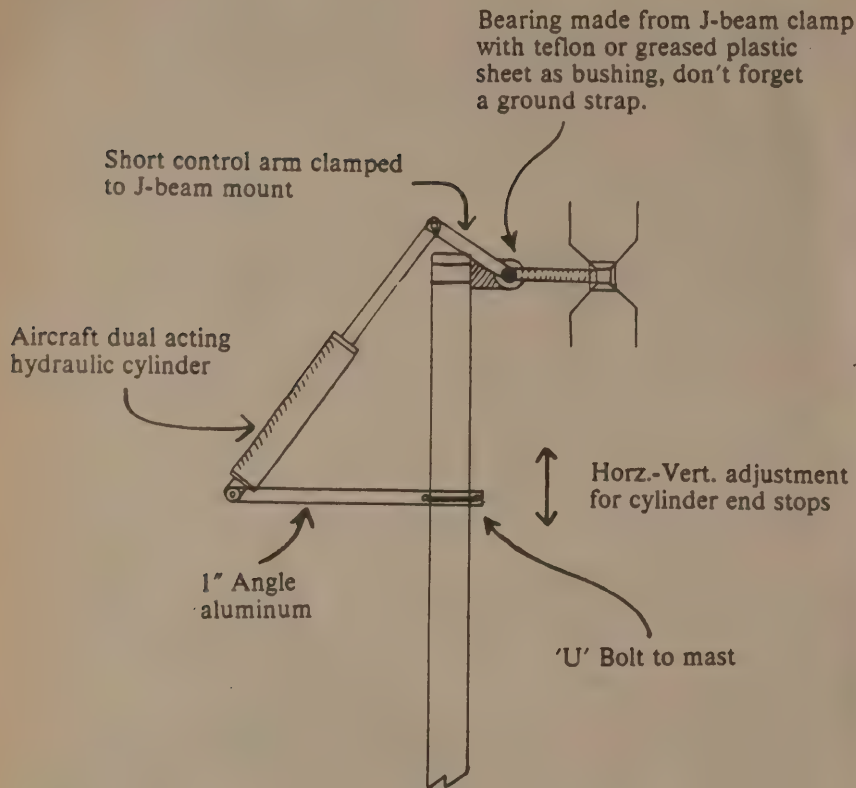
*Agreement with Icom requires 100 valid entries to contest. Enter soon, tell your friends!

SEND ENTRY TO: WWATS/ATVQ VIDEO CONTEST, 353 S. 116TH ST. SEATTLE, WA 98168

Entry form may be copied as needed.

ATV ANTENNA POLARIZATION CONTROL

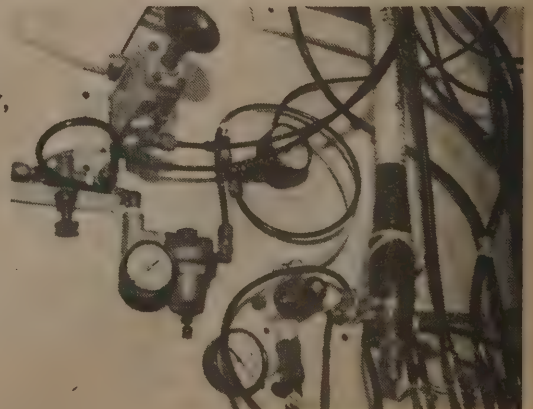
BY BOB SPAHN



Beam shown in vertical configuration
(not to scale)



The hydraulic cylinder works well as a pneumatic actuator and in use air volume is very small, 40 psi is all that is required for actuation. Air can be supplied from a small compressor of the type used to inflate tires. I used two air lines running up to the cylinder, although one line and a electric operated valve mounted at the mast could be used. This configuration has been very handy, for local contacts vertical is needed, for dx push a button and you have horizontal.



23 CM PLL EXCITER FOR ATV

BY BILL PARKER W8DMR

A single IC and the PC Electronics TVG 12 A oscillator make a very low cost 1.2 Ghz (23 cm) exciter unit. For about \$49 the phase lock loop exciter can be assembled. The TVG 12A can be purchased from PC Electronics and the SP-5060 IC from any supplier who represents Plessey Semiconductor.

The basic PLL principle is shown in the figure 1. Some additional circuit elements need to be incorporated into the PLL configuration. The two inputs to the phase comparator or phase detector should be of the same frequency range. Let the stable reference frequency be 4.9152 MHz and let the voltage controlled oscillator (VCO) frequency be 1258.2912 MHz as an example to understand fixed modulus frequency synthesizers. Some frequency division must be done if the two inputs to the phase comparator are to be about equal.

Downconverters are used to scale the inputs to the comparator to the same frequency range. The phase comparator and the downconverter are part of the SP-5060 IC. The phase comparator needs only to perform at the low frequency of approximately 4,800 Hz. The SP-5060 has a reference frequency upper limit specified at about 8 Mhz. Each of the downconverters may be partitioned into sections that are powers of two. The first section of a counter must perform at the highest operating frequency, therefore special circuitry and higher currents are normally needed. A counter placed before another counter is referred to as a pre-scaler.

Although the SP-5060 was designed for use in a satellite TV receiver, the IC along with a VCO forms a complete phase lock loop synthesizer. Only one external transistor is required to drive the varicap diode. Three passive components are needed for the loop filter. A more detailed block diagram shows the SP-5060 internal functions. The IC operates with +5 V DC and draws about 50 ma.

The output frequency of the VCO will be 256 times the crystal

oscillator reference frequency. The exciter Rf output into a 50 ohm load is a minimum of 50 mw which is ample to drive a SC-1043 brick amplifier to 5 watts or more.

The phase comparator does it all. If the scaled frequency of the VCO does not match the scaled frequency of the reference an error signal is produced at the output of the comparator. The error signal increases or decreases depending on whether the scaled VCO frequency is higher or lower than the scaled reference frequency. The error signal is then amplified and filtered (smoothed) and connected to the input of the VCO.

A charge pump sends the error signal to the loop amplifier. A charge pump can supply current to a circuit element or it can withdraw current from the same circuit element. It is much like adding or draining water from a bucket, so to speak. And since a bucket can store water, the charge storing element in the circuit is usually a capacitor.

If the phase of the signal derived from the reference crystal is the same phase of the signal derived from the VCO, then the error signal (except for a constant) is considered zero. If the loop amplifier gain is high as soon as the error signal starts to increase, the VCO is requested to make the necessary frequency correction and reduce the error signal to a low value. The loop is then considered phase locked.

The schematic diagram includes the video amplifier and the pre-emphasis network for modulating the TV 12A with either AM or FM. The video amplifier is required to compensate for the 13.5 db attenuation of the pre-emphasis network. The network must be driven from a 75 ohm source. The network must also be terminated into a 75 ohm load. The pre-emphasis will not be correct otherwise.

The FM video gain pot on the TVG12A needs a 330 ohm resistor connected in parallel to provide a 75 ohm network load. Don't skip this simple task. Adding another

330 ohm resistor across the AM video gain pot provides equal loading for the video line driver.

If the 18 uH choke has, for example, two ohms of internal DC resistance, then the series resistor should be 18 ohms and not 20 ohms. The total DC resistance of the inductor and the resistor should be 20 ohms. The correct frequency response will not be obtained otherwise.

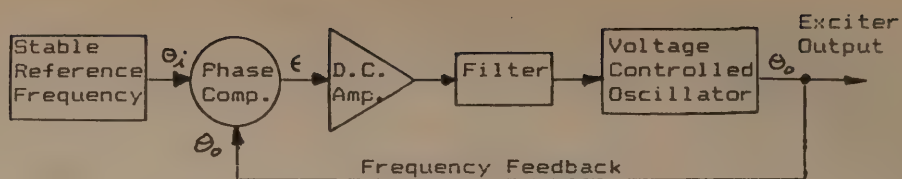
Located in the IC is a darlington emitter follower with pin 7 as the output. The external transistor Q3 and the internal emitter follower together form the DC loop error amplifier.

The filter components C1, C2, R2 are connected in the path from the output of Q3 to pin 8 of the IC. Pin 8 is the input to the Darlington emitter follower. The output of the current pump is internally connected to the input of the Darlington emitter follower. Pin 8 is effectively the summing junction of a simple op-amp configuration. Because there is NOT an input summing resistor the amplifier performs as a current to voltage converter. The charge pump supplies the current input to the low input impedance of the formed op-amp. The signal level at pin 8 is low because of the nature of the summing junction acting as a virtual ground.

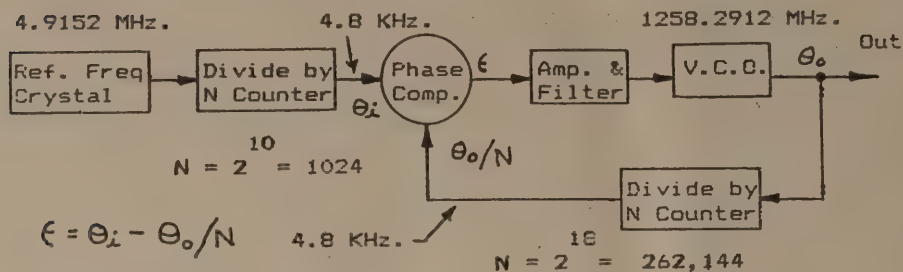
The phase lock loop including the filter forms a second order operating system. One purpose of the filter is to smooth out the ripple variations introduced by the phase detector. The amplifier and passive element combination from a filter with medium gain and low pass filter characteristics.



*** PART OF PLL ***
VOLT. CNTRL. OSC.
VARACTOR DIODE
AM VIDEO INPUT
FM VIDEO INPUT

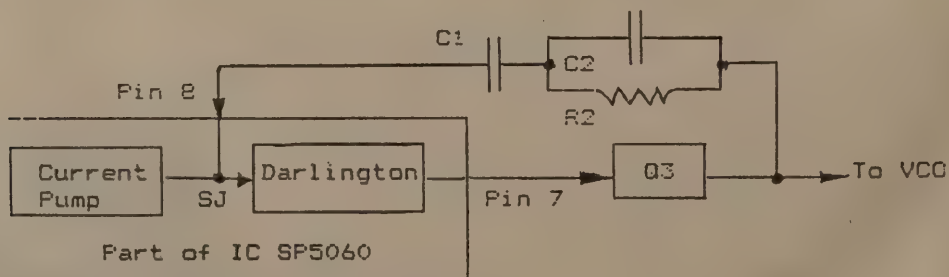
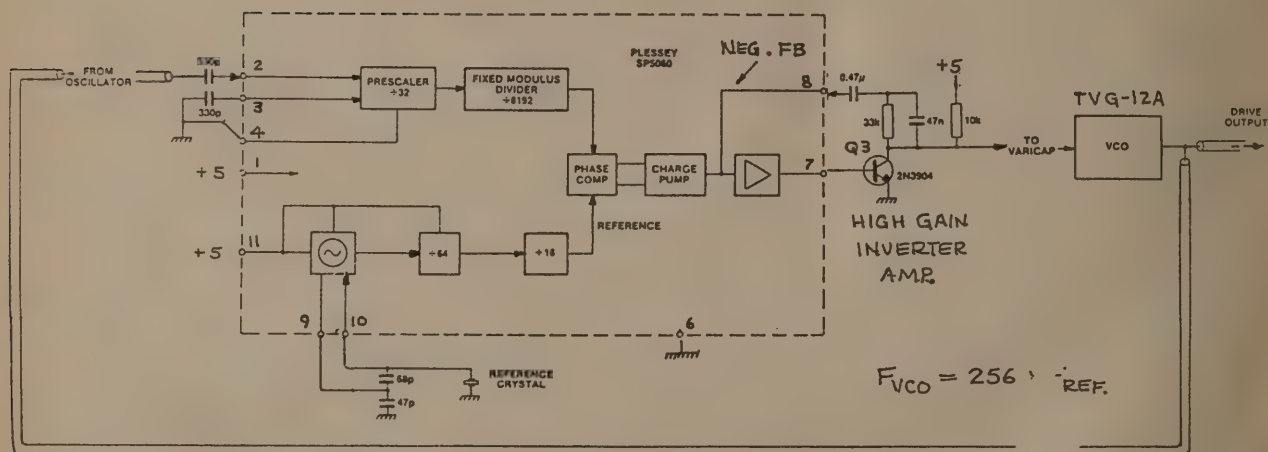


Basic Phase Locked Loop (PLL) Block Diagram



Block Diagram of PLL using downcounters

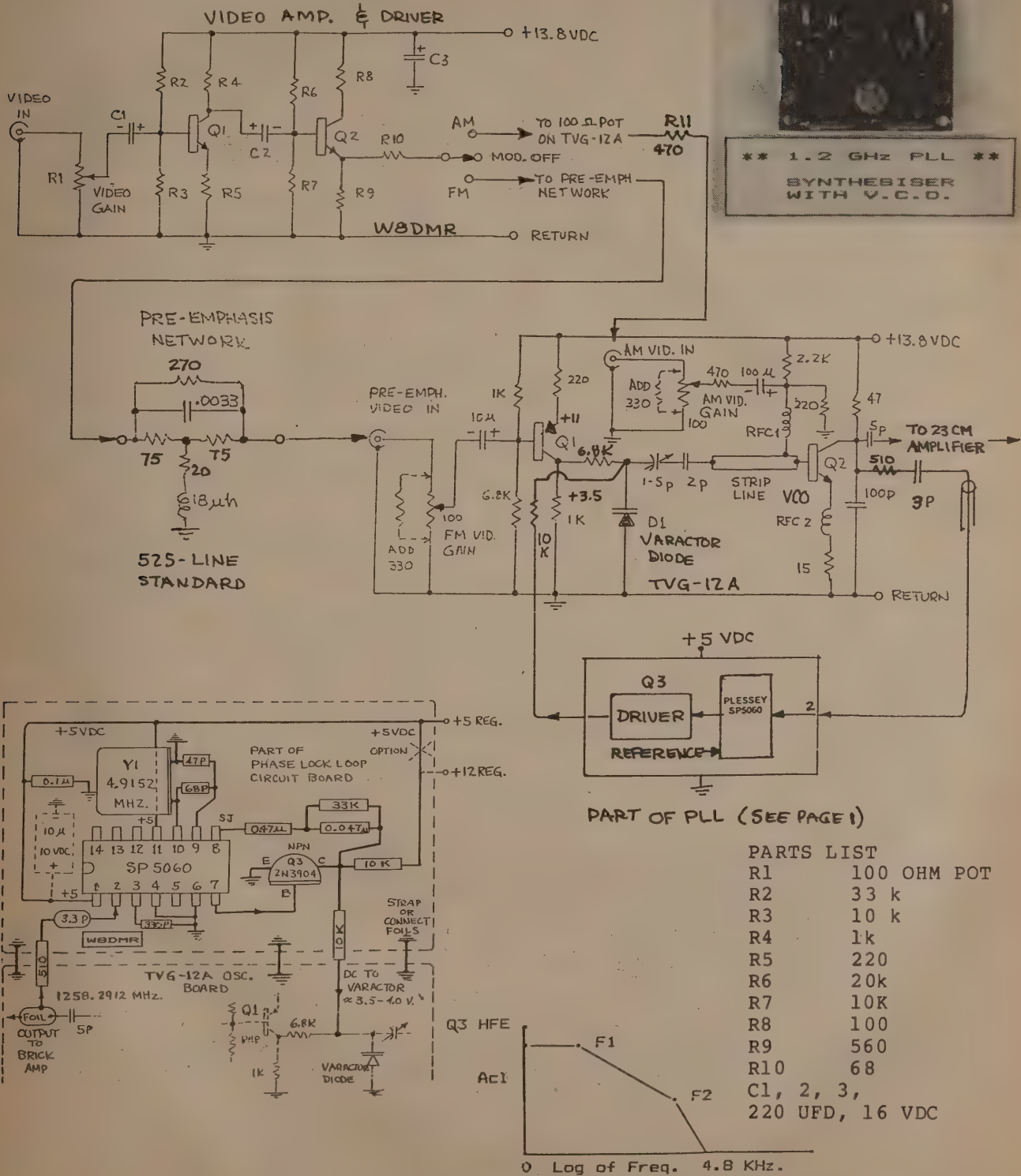
1.2 GHz PHASE LOCKED LOOP BLOCK DIAGRAM



The transfer function (TF) of the feedback network-amplifier,

$$\begin{aligned}
 T1 &= C1 \\
 T2 &= R2(C1+C2) \\
 T3 &= R2C2 \\
 s &= j\omega
 \end{aligned}
 \quad
 TF = - \frac{j\omega R2(C1+C2)}{(j\omega C1)(j\omega R2C2)} = - \frac{(sT2 + 1)}{(sT1)(sT3 + 1)}$$

1.2 GHz PLL EXCITER WITH AM/FM MODULATOR FOR AMATEUR TELEVISION



The response of the 2-pole filter/amplifier is shown. A_{cl} is the closed loop gain of the amplifier-filter.

FRANKLIN COLLINEAR ARRAY

The collinear antenna array described in this article is a Franklin type of an array with reflectors spaced behind each element. There are 36 driven elements and 36 reflectors for a total of 72 active elements. For 70 cm, the driven elements are 13 inches in length, and the reflector elements are 5 percent longer or 13-5/8 inches. The phasing stubs are 13 inches in total length, and the stacking distance between bays is 13 inches. A noncritical spacing between driven elements and reflectors is 5-1/2 inches or approximately 0.2 wavelength.

The feed point impedance of the array is in the range of 300 ohms, and a good grade of 300 ohm twin lead matches well. At the transmitter end, a coaxial cable balun is used to transform the impedance from 300 to 50/75 ohms for connection to the transmitter and/or receiver.

The balun is constructed of RG-59 75 ohm cable as shown in Figure 1. The 1/2 wave balun loop length is calculated as follows:

$$13 \text{ inches} \times 0.66 \text{ velocity factor} = 8.58 \text{ inches}$$

All shields are connected together, and the balun converts 75 ohms to 300 ohms (a 4 to 1 impedance change).

Figure 2 depicts the overall array concept. The elements and phasing stubs are made of 1/8 inch soft aluminum clothes line wire. Figure 3 shows the details of the bending procedure for the driven elements. The dots indicate where nails can be driven in a board to serve as a template for bending. Four are required: two for bay one and two for bay three. The configuration for bay two is somewhat different. Two are required for bay two.

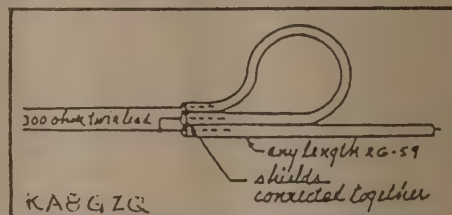


Fig.1-BALUN CONNECTION

The formed elements are fastened as shown in Figure 2 and assembled onto a wooden frame constructed from 3/4 by 3/4 inch redwood designed to minimize weight. The folding of the elements reduces the number of electrical connections to a minimum. Use of the nail template makes bending easy and provides uniform element sections.

No connection is made between all of the reflectors and the driven elements; each reflector is independent. A reflector is mounted behind each driven element.

The array has about 18.5 dB of gain as compared to a single dipole. The antenna exhibits a front lobe width of about 15 degrees with two side lobes of 12 dB down. The front-to-back

FRANKLIN COLLINEAR ARRAY

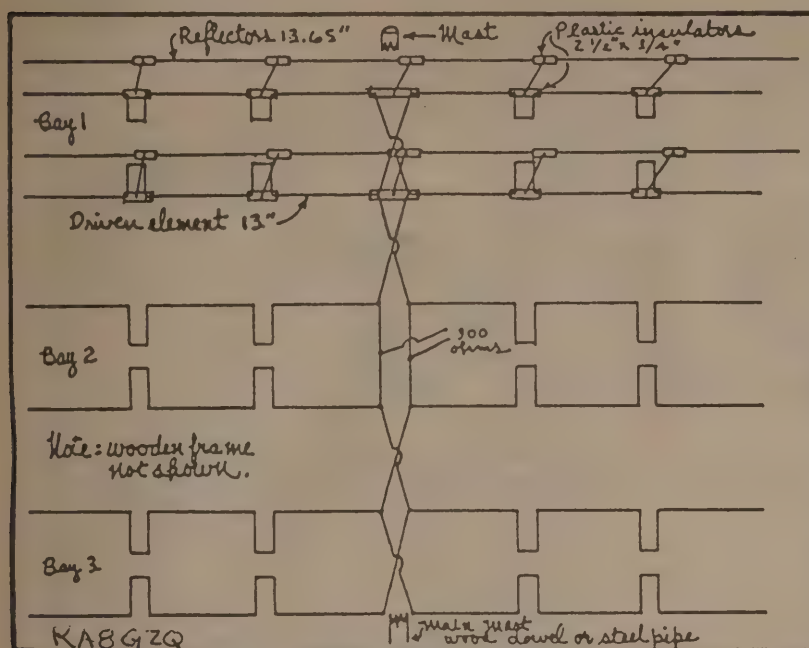


Fig.2-ANTENNA ARRAY

(see Figure 4). The Franklin design has been scaled (and adjusted and tested) for the 33 cm and 23 cm (910 and 1258 MHz) bands with equally good results. (Submitted by Dick, WBRVH.)

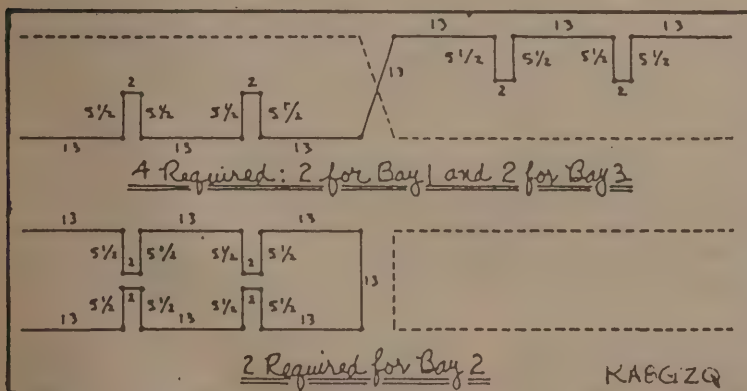


Fig.3-BENDING LAYOUT

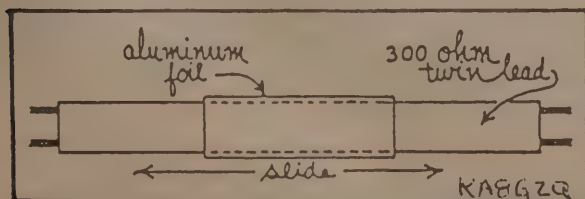


Fig.4-SWR CORRECTION

ATCO NEWSLETTER

ratio is only about 8 dB and considered not very good. However, this is an advantage when the direction of the incoming signal is not known. One disadvantage of the 72 element array is wind resistance which depends on just how the antenna is stowed with respect to wind direction.

A final correction of SWR can be made by sliding a two inch piece of aluminum foil up-and-down the insulated twinlead at the transmitter end

WWATS NEW?!

Western Washington Amateur Television Society has had a busy summer with a variety of activities.

A functioning 434/900 Mhz ATV repeater was the result of a joint effort by Chuck Northcutt, W7SRZ, President of WWATS, who purchased the major components, a Lou "Wizard" Hutton, K7YZZ, who assembled the pieces. The completed repeater was donated to the club.

The 434/1200 Mhz repeater owned by Gary Sultan, K6HVI, has been reconfigured in preparation for a move to a higher location.

Chuck Zappala, KE7SA, Tom Asaif, K7KAI, and Bill Hoppe, W7GWU have spent the summer months looking for "The" ultimate locations for both repeaters atop the numerous hills of Western Washington.

A group of ATVers led by Bob Castaneda, KC7QR, made an expedition to Mt. Pilchuck, North of Everett, Washington to transmit live and video tape pictures from the mountain top. They received and taped transmissions from the various member ATV stations in the Western Washington and British Columbia, Canada.

A similar activity occurred when a group of Amateurs from AEA climbed to the 7,000 foot level of Mt. Rainier and transmitted P5 pictures to an ATV station at the Tacoma Hamfair in August.

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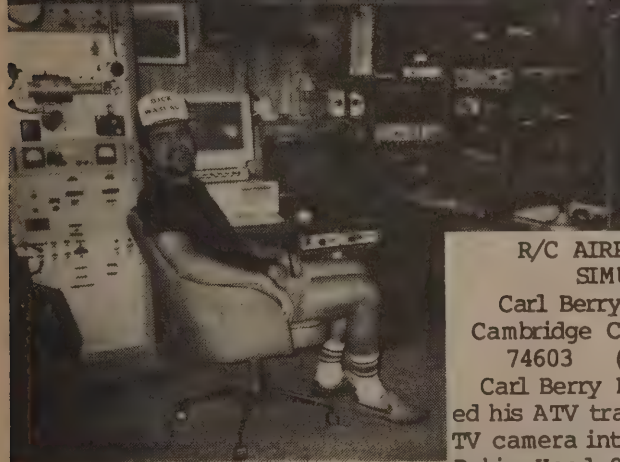
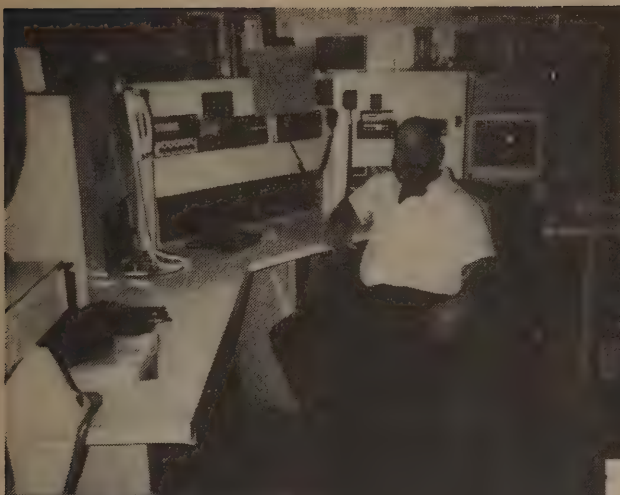
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COMING IN THE NEXT ISSUE OF **CQ-TV**

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THE BRITISH AMATEUR TELEVISION CLUB



YORK ATV'ers

R/C AIRPLANE FLIGHT SIMULATOR

Carl Berry K5MWN #25
Cambridge Ct., Abilene, TX
74603 (915) 672-1319

Carl Berry K5MWN has mounted his ATV transmitter and Color TV camera into his quarter scale Robin Hood 99 R/C aircraft to produce a pilot's eye view of flying model aircraft. Also he has taken an arcade game and converted it into a complete flight simulator. Inside the arcade game he has mounted an ATV receiver and monitor as well as complete flight controls.



R/C FLIGHT SIMULATOR

With this setup you can take off, fly and land the R/C airplane without ever looking up at the plane. Carl mentions that it takes a certain of piloting skill as those who have never flown a real plane tend to crash!

A complete detailed construction article of this system will be included in the next issue of ATVQ.

Due to the Ham involvement in the California and Texas disasters, we will extend special offer mailed to subscribers from October 15 to December 1. This will allow those directly affected and those assisting time for their lives to return to normal.

CHAMPAIGN BALOON FLIGHT

At 10:43 am CDT on Oct. 7th a helium balloon was launched by Bill WB8ELK and Mark KA9SZX from Tim KA9SZY's farm west of Champaign, Illinois. The payload was built by WB8ELK and Bob N8IYD and was identical to the flight made from Ohio in July with the exception of a servo operated mirror. The mirror would move away from the front of the camera allowing periodic views of the horizon as well as the view of the earth down below.

Saturday morning turned out to be crystal clear with unlimited visibility and with no wind! About 30 spectators were on hand to watch as the package and flight train was assembled. After receiving the weather bureau wind profiles for the morning our ground computer was fired up to give us the landing prediction. The first of our problems were encountered when the computer failed! However a quick call to Joe WB8MSJ saved the day when he ran the prediction on his system back in Ohio. The prediction was 108 miles to the east for a landing northwest of Indianapolis. The Indianapolis fox hunter group gathered within a 20 mile circle of this point to wait for the balloon package to drop on them! Since the balloon would be travelling through a very strong jet stream it would be actually moving over 120 MPH ground speed at times.

During the final test of the package we discovered that the on-board flight computer and altimeter would not start up! After an hour of futile efforts we tried a heat gun on it since it was so cold in the barn. Apparently the reset circuit liked it warm and it started right up...I did too as I used the heat gun on myself for awhile!! Tim's barn was a little low for a 8 foot balloon and we had to carry it out crawling on our hands and knees to remove it. Just when we thought we had every aspect of launching balloons down to a science Mother Nature throws us another curve. As we were getting set to launch the balloon in the field a 20 MPH wind gust popped up out of nowhere! The balloon came within seconds of blowing up as the winds gusted higher. Mark had to let go before we were in

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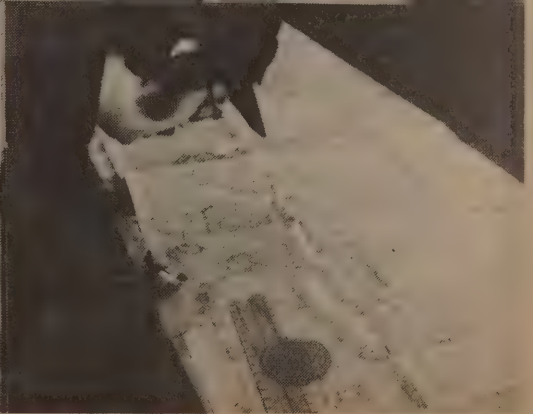
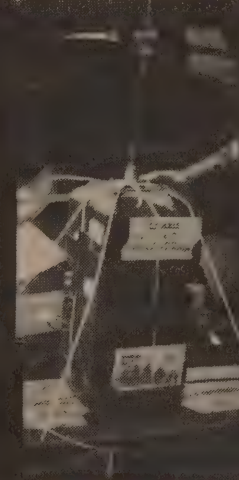
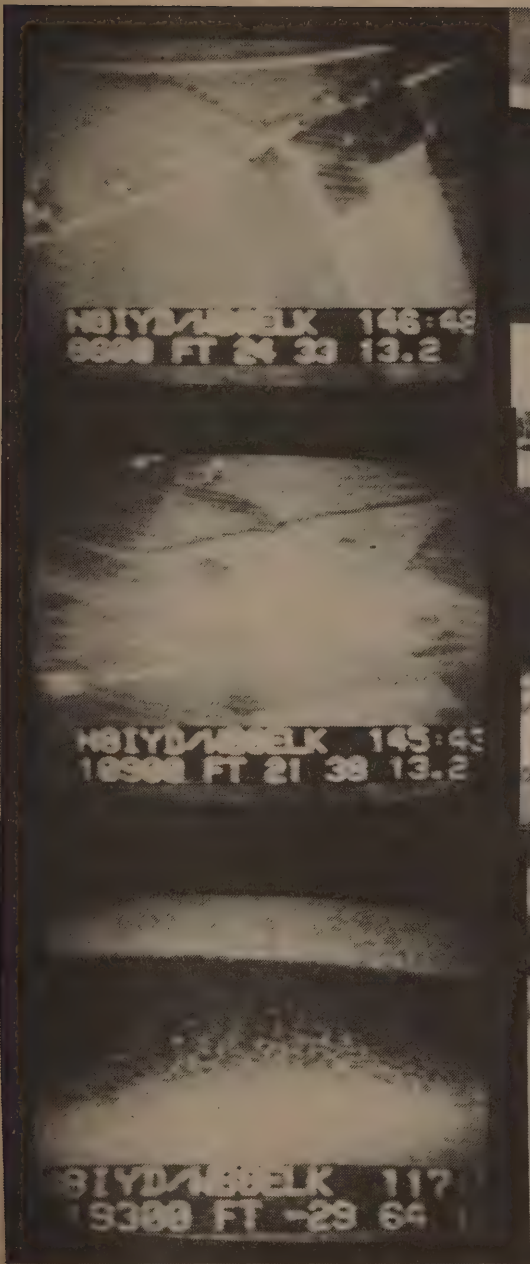
position and the package went up for a few feet and then crashed in the field before bouncing off and heading on it's way. The omnidirectional Big Wheel ATV antenna received extensive damage (I now call it the Big MESS antenna) and the mirror mount broke partially loose. Fortunately everything still worked except the ATV signal was down at least a P-Unit from previous flights (Although we had a lot of vertical component this time). Also the mirror would not move completely out of the camera view causing an interesting split screen effect. Spectacular views of the Illinois countryside were seen on the ATV downlink and the horizon shots were tremendous. At the higher altitudes this horizon view actually showed quite clearly the blackness of outer space and the earth's curvature. At about 80,000 feet the balloon slowed down and stayed over Raccoon Lake in western Indiana. This lake and the Wabash River were easily viewable for nearly 20 minutes. At 119,300 feet the balloon burst as the camera was looking at the edge of space and provided us with an amazing ride down to earth. At this point the ATV signal was seen from near the Des Moines, Iowa area to the west and as far east as K3IBD near Pittsburgh, PA. Also reception of the 2 mtr beacon was heard as far as South Carolina. As the package parachuted down lower incredible ground detail could be observed. The position could be determined using just county road maps and watching the video! The balloon finally landed 32 minutes after burst in a soybean field 6 miles east of Lebanon, Indiana having travelled over 113 miles. Since the prediction missed by only 8 miles most of the Fox Hunters were just a few miles away and with the help of Tim KA9SZY in the chase plane the package was discovered by Kevin N9FWB, Rick N9HLL and John K9JD in about 30 minutes. They were only 2 miles away when it landed and caught a glimpse of it as it hit. They also saw a brief view of their car sitting on the side of the road from the balloon video just before landing! Shortly afterwards the entire Indy foxhunt group descended on the scene. Two

cars had left Champaign after the launch. Phil KA9WGN and Debbie KA9JYI in one car and Mark KA9SZX and myself in the Elkmobile. Even though we were travelling over 80 MPH down the freeway at times we still were over 30 miles away when the package hit! Since the Indianapolis area is only 25 miles away we dropped the payload near several of the local ATV'ers. Tom KC9JX and Ron KD9QB live just a few miles away and were able to record the descent until just 50 feet of hitting the soybean field.

Considering the rough takeoff the mission was a success (we got it back!!) although the package suffered more damage on takeoff than landing. As we were leaving the area we were given a very strange look from the farmer as he started to harvest the soybeans!! Another hour earlier he would've seen more than soybeans growing in his field!

Future missions will continue in the spring and will include a pressure relief valve to control the altitude before the balloon bursts. Also in the works are an ATV repeater (910.25 MHz in - 439.25 out), a delayed action two meter repeater, a packet digipeater and a glider flight released from 100,000 feet which we hope to fly back to the launch site. 73's Bill - WB8ELK





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Contents of submittal may be on any video or ham TV topic. Operating news and station or repeater news is used on a space available basis and a first come-first published basis. News items over 1 page in length are more difficult to use than shorter items. Exceptions would be technical explanations of repeater or operating systems and public service stories with first hand accounts.

Photos should be included whenever possible. Black and white or color photos may be submitted. Color photos will likely be printed in black and white unless editorial decision is otherwise.

Product reviews are limited to 1 page. However, a manufacturer may provide an article of general interest on a subject which includes specifics about particular products of any length provided the topic is well based as a subject and not based solely on a product.

Items which we will not publish:

Items which contain negative remarks about a product or service unless the manufacturer has had an opportunity to review the comments and submit rebuttal. Space will be provided for rebuttal adjacent to the item.

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Promotional items under the guise of editorial comment will not be printed. Technical information must be first hand or verifiable sources used. We do not print hearsay, fantasy, fiction or speculation under the guise of fact or editorial opinion..

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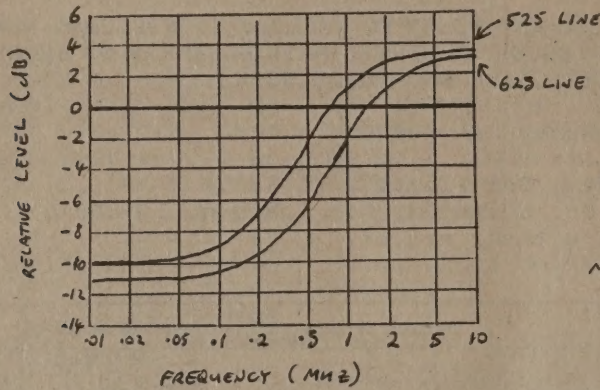
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<table border="0"> <tr> <td>Full Name</td> <td>Complete Mailing Address</td> </tr> <tr> <td>Henry Ruh</td> <td>540 E Oakton Des Plaines, IL 60018</td> </tr> <tr> <td>Bill Brown</td> <td>12735 TR 77 Findlay, OH 45840</td> </tr> </table>			Full Name	Complete Mailing Address	Henry Ruh	540 E Oakton Des Plaines, IL 60018	Bill Brown	12735 TR 77 Findlay, OH 45840
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8. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages or Other Securities (If there are none, so state)								
<table border="0"> <tr> <td>Full Name</td> <td>Complete Mailing Address</td> </tr> <tr> <td>NONE</td> <td></td> </tr> </table>			Full Name	Complete Mailing Address	NONE			
Full Name	Complete Mailing Address							
NONE								
9. For Completion by Nonprofit Organizations Authorized to Mail at Special Rates (DMM Section 433.12 only) The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes (Check one)								
<table border="0"> <tr> <td>(1) <input type="checkbox"/> Has Not Changed During Preceding 12 Months</td> <td>(2) <input type="checkbox"/> Has Changed During Preceding 12 Months</td> <td>(If changed, publisher must submit explanation of change with this statement.)</td> </tr> </table>			(1) <input type="checkbox"/> Has Not Changed During Preceding 12 Months	(2) <input type="checkbox"/> Has Changed During Preceding 12 Months	(If changed, publisher must submit explanation of change with this statement.)			
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10. Extent and Nature of Circulation <small>(See instructions on reverse side)</small>	Average No. Copies Each Issue During Preceding 12 Months	Actual No. Copies of Single Issue Published Nearest to Filing Date						
A. Total No. Copies (Net Press Run)	3450	1800						
B. Paid and/or Requested Circulation 1. Sales through dealers and carriers, street vendors and counter sales	1150	912						
2. Mail Subscription (Paid and/or requested)	800	856						
C. Total Paid and/or Requested Circulation (Sum of B1 and B2)	1950	1768						
D. Free Distribution by Mail, Carrier or Other Means Samples, Complimentary, and Other Free Copies	1500	30						
E. Total Distribution (Sum of C and D)	3450	1798						
F. Copies Not Distributed 1. Office use, left over, unaccounted, spoiled after printing	0	2						
2. Return from News Agents	0	0						
G. TOTAL (Sum of E, F1 and F2—should equal net press run shown in A)	3450	1800						
11. I certify that the statements made by me above are correct and complete								
Signature and Title of Editor, Publisher, Business Manager, or Owner Henry B. Ruh, Publisher		(See instructions on reverse)						

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**PRE-EMPHASIS/DEEMPHASIS
NETWORKS FOR FM ATV
Mike Sheffield, ZL1ABS**

Here are values and response curves for both NTSC and PAL (525/625) TV systems to provide the correct pre-emphasis and corresponding de-emphasis for the video. Note that all networks must work into and be fed from a 75 ohm load/source impedance in order to function properly.

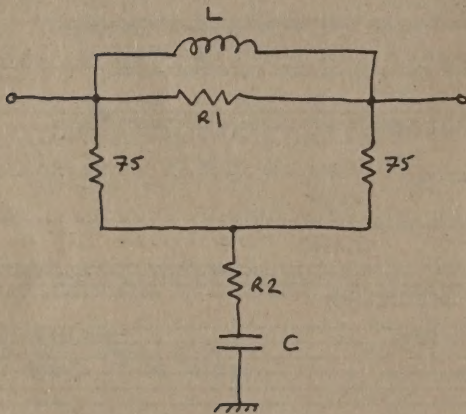


PRE-EMPHASIS CHARACTERISTICS

NOTE: 0 dB (CROSSOVER) FREQUENCY

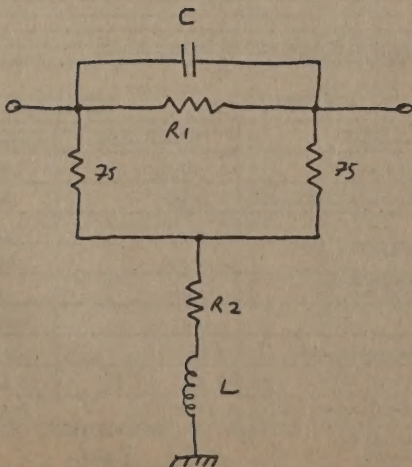
525 LINE = 761 KHz

625 LINE = 1.512 MHz



DE-EMPHASIS NETWORK

	525	625
L	50.16 μ H	30.53 μ H
C	8917 pF	5424 pF
R ₁	275.8 Ω	300 Ω
R ₂	20.4 Ω	18.75 Ω



PRE-EMPHASIS NETWORK

	525	625
C	3100 pF	1695 pF
L	18 μ H	9.5 μ H
R ₁	270 Ω	300 Ω
R ₂	20 Ω	18.75 Ω

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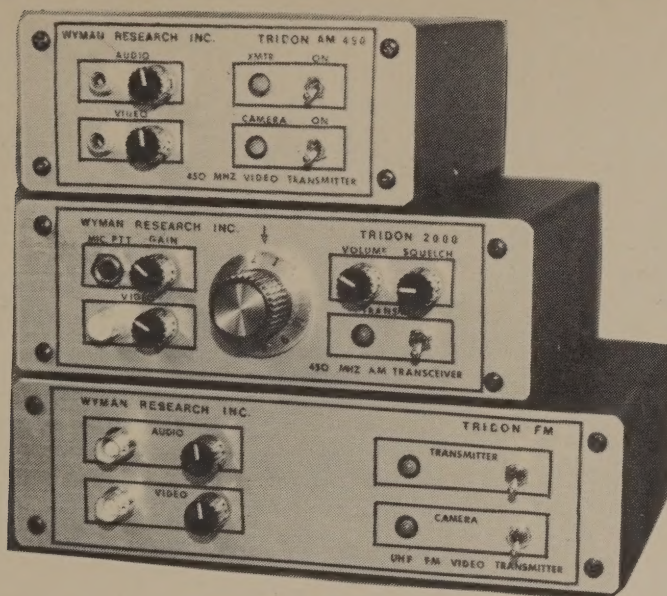
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450 TRANSMITTER

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- TWO INDEPENDENT AUDIO SYSTEMS
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- 10 PIN CAMERA CONNECTOR ON BACK-BNC OR RCA CONNECTORS ON FRONT
- SYNC STRETCHER FOR OPTIMUM COMPOSITE VIDEO
- STANDARD CRYSTAL FREQUENCY: 439.25 MHZ or 434.00 MHZ
- POWERS VIDEO CAMERA (10 Pin Connector)
- REQUIRES 13.8V DC AT 600 MA PLUS CAMERA POWER (1 amp)
- RF TIGHT ALUMINUM CABINET WITH BRUSHED ALUMINUM PANEL CUSTOMED DESIGN-ED BY W9YL
- CABINET SIZE: 2.2"x5.25"x5.5"

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 - "N" CONNECTOR
 - RF TIGHT ALUMMINUM CABINET WITH BRUSHED ALUMINUM PANEL CUSTOM-ED DESIGNED BY W9YL
 - CABINET SIZE: 2.2"x8.2"x5.5"
 - REQUIRES 13.8 V DC AT 2 AMPS
 - LARGE HEAT SINK
- ### 900 MHZ
- 915 MHZ FM-ATV TRANSMITTER
 - POWER OUTPUT IS 8 WATTS
 - 4.5 MHZ AUDIO SUB-CARRIER
 - USES NEW PHASE LOCK LOOP CRYSTAL CONTROLLED EXCITER
- ### 1200 MHZ
- 1255 MHZ FM-ATV TRANSMIT-TER (Any optional freq.)
 - POWER OUTPUT IS 4-5 WATTS
 - 6 MHZ AUDIO SUB-CARRIER (Requires 1 V PP Audio)
 - USES MILITARY QUALITY WOOD-DOUGLAS CRYSTAL CONTROLLED EXCITER

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The AEA engineering standards of high performance are evident in this new transceiver. The FSTV 430 has a sensitive UHF GaAsfet preamp with a crystal controlled downconverter and IF filter (channel 3 or

4) for signal reception. The transmitter in the FSTV 430 uses a VSB (Vestigial Side Band) design to minimize adjacent channel interference. Two frequencies can be selected for transmission, one crystal is included.

Signal output is one watt p.e.p..

Any amateur with a technician class (or higher) license can join the fun of ATV. The FSTV 430 can transmit in either black and white or color. The portable, lightweight FSTV 430 transceiver can be used for in station or on the go operation. You can even connect your VCR for transmission of video tapes.

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